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**US Army Corps  
of Engineers**

Fort Worth District

THE GORDIAN GROUP

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CORPUS CHRISTI ARMY DEPOT  
CORPUS CHRISTI, TEXAS

**JOB ORDER CONTRACT (JOC)**

VOLUME III

JOB ORDER CONTRACT TECHNICAL SPECIFICATIONS  
(DIVISIONS 01 - 16)

NOTE

**THIS IS AN UNRESTRICTED SOLICITATION**



## Table of Contents

<b>01000</b>	<b>General Requirements</b>	<b>01 - 1</b>
01660a	PRECISION TESTING OF UNDERGROUND FUEL OIL TANKS.....	1
01660b	HYDROSTATIC PRESSURE TESTING OF AIR RECEIVING TANKS .....	3
<b>02000</b>	<b>Site Work</b>	<b>02 - 1</b>
02010	STANDARD PENETRATION TESTS .....	1
02102	CLEARING AND GRUBBING.....	2
02110	DEMOLITION SELECTED ITEMS .....	3
02113	ASBESTOS ABATEMENT.....	4
02115	UNDERGROUND STORAGE TANK REMOVAL.....	31
02118	LEAD PAINT ABATEMENT .....	39
02210	SITE GRADING.....	56
02211	ROCK REMOVAL.....	58
02221	EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS .....	59
02222	STRUCTURAL EXCAVATION.....	61
02226	SITE EXCAVATION AND FILL .....	62
02231	FIELD TESTS .....	63
02240	SOIL STABILIZATION - CRUSHED ROCK SUBGRADE .....	64
02241	SOIL STABILIZATION - LIME .....	65
02243	SOIL STABILIZATION - VIBROFLOTATION .....	66
02244	SOIL STERILIZATION .....	67
02245	FINISH GRADING FOR STRUCTURES AND SLABS .....	68
02261	RIPRAP .....	69
02262	GABIONS .....	70
02263	SOIL - CEMENT SURFACING .....	71
02264	EROSION CONTROL .....	72
02300	PILES.....	73
02400	SHEET PILING, SHORING, UNDERPINNING.....	80
02440	IRRIGATION SYSTEM.....	82
02450	PIPE SLEEVES FOR UTILITY LINES .....	86
02467	PIPE LINING .....	87
02511	FOUNDATION DRAINAGE SYSTEMS.....	90
02512	UNDERSLAB DRAINAGE .....	92
02520a	STORM DRAINS .....	94
02520b	TRENCH DRAINS.....	96
02531	SAND DRAINS.....	99
02551	GAS DISTRIBUTION LINES .....	100
02555	WATER LINES.....	101
02557	WATER RESERVOIRS AND TANKS .....	105
02559	SITE CHILLED WATER LINES.....	107
02560	SEWER LINE CLEANING .....	109
02561	SEPTIC TANKS AND GREASE TRAPS.....	110
02611	CRUSHED STONE BASE .....	111
02612a	BITUMINOUS PAVING.....	113
02612b	SPRAY APPLICATIONS, SEAL COATS, AND SURFACE TREATMENTS TREATMENTS (also covers 02617).....	116
02614a	PORTLAND CEMENT CONCRETE.....	118
02616	BITUMINOUS PAVING - REPAIR AND RESURFACING .....	119
02616b	CRACK SEALING OF BITUMINOUS PAVEMENTS .....	121
02618a	TRACK, COURT, AND PLAYGROUND MARKINGS .....	123
02618b	PAVEMENT MARKINGS .....	126
02619	CRUSHED STONE PAVING .....	128
02620a	CONCRETE CURBS AND GUTTERS .....	130
02620b	STEEL CURBS.....	132
02620c	GRANITE CURBS .....	134
02630a	PORTLAND CEMENT CONCRETE SIDEWALKS.....	136
02630b	ASPHALT CONCRETE SIDEWALKS.....	138
02630c	MISCELLANEOUS SIDEWALKS.....	141



## Table of Contents

02630d	PRECAST SIDEWALKS AND PAVERS.....	143
02630e	PRECAST INTERLOCKING PAVERS .....	145
02710a	WROUGHT IRON ROD AND BAR FENCING .....	148
02710b	SNOW AND OTHER TEMPORARY FENCING.....	149
02711a	FENCES AND GATES.....	151
02711b	STEEL CHAIN-LINK FENCING .....	153
02713	PERMANENT WOOD FENCING.....	156
02719	MODULAR RETAINING WALL.....	158
02721	GUARD RAIL AND IMPACT ATTENUATORS.....	162
02730a	PLAYING FIELDS.....	163
02730b	COLORED ATHLETIC WEARING SURFACE .....	165
02731	RECREATIONAL FACILITIES.....	166
02800	LANDSCAPING (general) .....	168
02810a	SEEDING .....	175
02810b	SODDING .....	176
02820	TOPSOIL .....	180
02830	TREE RELOCATION .....	182
02831	TREE AND PLANT PROTECTION .....	190
02850a	CONCRETE TIE AND BALLASTED TRACK.....	194
02850b	TRACK CONTROL SURVEY MARKERS .....	197
02850c	HI-RAIL ACCESSES, TIMBER PANELS, AND GRADE CROSSINGS .....	199
02850d	DIRECT FIXATION RAIL FASTENERS .....	202
02850e	RESILIENTLY SUPPORTED TRACK.....	218
02850f	CONTINUOUS WELDED RAIL.....	226
02850g	BALLASTED TRACK .....	231
02850h	DIRECT-FIXATION TRACK.....	235
02850i	TRACK APPURTENANCES .....	238
02850j	CONTACT RAIL SYSTEM .....	245
02850k	TRACTION POWER BONDS.....	260
02850l	CROSSWALK AND GRADE CROSSING .....	262

## 03000 Concrete

03 - 1

03100	CONCRETE FORMWORK.....	1
03200	CONCRETE REINFORCEMENT .....	3
03250	CONCRETE ACCESSORIES .....	5
03300	CAST-IN-PLACE CONCRETE .....	7
03305	CONCRETE CURING .....	12
03320	CONCRETE TOPPING .....	13
03351	EXPOSED AGGREGATE CONCRETE .....	14
03352	RUSTICATED CONCRETE FINISHES .....	16
03353	SOLID BOARD CONCRETE FINISHES .....	17
03354	FLEXURAL CONCRETE.....	18
03362	PUMPED CONCRETE.....	19
03363	SECOND-POUR CONCRETE.....	20
03414	MISCELLANEOUS PRECAST ITEMS .....	21
03510	GYPSUM CONCRETE DECKS.....	22
03520	INSULATING CONCRETE ROOF DECKS .....	23
03521	PRECAST LIGHTWEIGHT ROOF SLABS .....	24
03530	CEMENTITIOUS WOOD FIBER ROOF DECK SYSTEMS.....	25
03600	GROUT.....	26
03700	CONCRETE RESTORATION AND CLEANING.....	27
03701	HOT WEATHER CONCRETING .....	30

## 04000 Masonry

04 - 1

04140	EPOXY MORTAR .....	1
04200	UNIT MASONRY .....	2
04205	SCAFFOLDING - TUBULAR STEEL .....	5
04210	BRICKWORK .....	6



## Table of Contents

04251	TERRA COTTA.....	9
04400	STONEWORK.....	11
04500	MASONRY RESTORATION.....	13

### 05000 Metals 05 - 1

05120	STRUCTURAL STEEL.....	1
05211	STEEL JOISTS.....	3
05311	METAL DECK.....	4
05500	MISCELLANEOUS METALS.....	8
05510	METAL STAIRS.....	14
05550	KITCHEN CASEWORK.....	17
05700	ORNAMENTAL METALS.....	22

### 06000 Wood & Plastic 06 - 1

06111	LIGHT WOODEN STRUCTURES FRAMING.....	1
06113	SHEATHING, SIDING, AND SUBFLOORING.....	4
06181	GLUE LAMINATED STRUCTURAL UNITS.....	8
06200	MILLWORK.....	10
06410	CABINETS.....	12
06420	WOOD PANELING.....	15

### 07000 Thermal & Moisture Protection 07 - 1

07112a	BITUMINOUS WATERPROOFING.....	1
07112b	BITUMINOUS MEMBRANE WATERPROOFING.....	3
07113	PLASTIC / RUBBER SHEET WATERPROOFING.....	5
07121	FLUID-APPLIED WATERPROOFING.....	6
07130	BENTONITE CLAY WATERPROOFING.....	8
07140	METAL OXIDE WATERPROOFING.....	10
07160	BITUMINOUS DAMPPROOFING.....	12
07170	SILICONE DAMPROOFING.....	13
07175	WATER-REPELLENT COATING DAMPPROOFING.....	14
07180	CEMENTITIOUS DAMPROOFING.....	15
07210	BATT AND BLANKET BUILDING INSULATION.....	16
07211	LOOSE OR GRANULAR FILL INSULATION.....	18
07212	RIGID INSULATION.....	19
07213	PERIMETER INSULATION.....	20
07215	SPRAYED-ON INSULATION.....	21
07223	ROOF INSULATION AND UNDERLAYMENT - CELLULAR GLASS.....	22
07224	ROOF INSULATION AND UNDERLAYMENT - MINERAL FIBER.....	23
07225	ROOF INSULATION AND UNDERLAYMENT - COMPOSITE BOARD.....	24
07227	ROOF INSULATION AND UNDERLAYMENT - FIBERBOARD.....	25
07250	SPRAYED-ON AND/OR HAND APPLIED FIREPROOFING.....	26
07310	ASPHALT SHINGLES.....	29
07313	WOOD SHINGLES AND SHAKES.....	31
07314	SLATE ROOFING.....	32
07320	CLAY ROOFING TILES.....	33
07322a	CONCRETE ROOFING TILES.....	35
07322b	PRECAST CONCRETE OR TILE TRAFFIC TOPPING.....	36
07400	PREFORMED ROOFING AND SIDING.....	37
07510a	BUILT-UP ROOFING.....	41
07510b	WOOD TRAFFIC TOPPING.....	46
07510c	COMPOSITION TRAFFIC TOPPING.....	48
07530	ELASTIC SHEET ROOFING.....	49
07544	SPRAYED POLYURETHANE FOAM (SPF) ROOFING.....	52
07550	INVERTED ROOF SYSTEMS.....	58
07600	SHEET METAL.....	61





## Table of Contents

07800	ROOF ACCESSORIES .....	65
07811	PLASTIC SKYLIGHTS .....	68
07812	METAL-FRAMED SKYLIGHTS .....	70
07830	ROOF ACCESS/SMOKE VENTS .....	72
07900	SEALANTS .....	74

## 08000 Doors & Windows 08 - 1

08110a	HOLLOW METAL DOORS AND FRAMES .....	1
08110b	STAINLESS STEEL DOORS AND FRAMES .....	6
08120	ALUMINUM DOORS AND FRAMES .....	11
08210	WOOD DOORS .....	13
08311	ALUMINUM AND WOOD SLIDING GLASS DOORS .....	17
08312	SLIDING FIRE DOORS - GENERAL .....	18
08330	COILING (ROLLING) DOORS .....	20
08350	FOLDING DOORS .....	24
08353	ACCORDION FOLDING DOORS .....	26
08355	FLEXIBLE DOORS .....	27
08360	OVERHEAD DOORS .....	28
08386	ALUMINUM SAFETY GLASS DOORS .....	30
08380	SOUND RETARDANT DOORS .....	31
08386	ALUMINUM SAFETY GLASS DOORS .....	32
08390	SCREEN DOORS .....	33
08510	METAL WINDOWS .....	34
08520	ALUMINUM WINDOWS .....	36
08520a	ALUMINUM REPLACEMENT WINDOWS .....	45
08610	WOOD WINDOWS .....	59
08710	FINISH HARDWARE .....	65
08720	OPERATORS .....	97
08721	AUTOMATIC DOOR EQUIPMENT .....	103
08730	WEATHER STRIPPING AND SEALS .....	105
08740	THRESHOLDS .....	109
08750	VISION GLASS .....	111
08810	GLASS AND GLAZING .....	118
08900	FINISH AND SECURITY HARDWARE .....	124
08912	ALUMINUM WINDOW WALLS / CURTAIN WALLS .....	146

## 09000 Finishes 09 - 1

09110	METAL FURRING AND LATHING .....	1
09111	STEEL METAL PARTITIONS .....	3
09150	PLASTER AND PLASTER REPAIR .....	5
09260	GYPSUM DRYWALL AND METAL STUDS .....	9
09315	TILE FLOORING .....	11
09320	CERAMIC WALL TILE .....	13
09400	TERRAZZO .....	16
09410	TERRAZZO TILE .....	20
09510	ACOUSTICAL CEILINGS .....	25
09530	ACOUSTICAL INSULATION AND BARRIERS .....	29
09535	SOUND ABSORBING PANELS .....	30
09560	WOOD STRIP FLOORING .....	31
09570	WOOD PARQUET FLOORING .....	34
09580	WOOD BLOCK INDUSTRIAL FLOORING .....	37
09590	GYMNASIUM FLOORING .....	38
09598	SOFTWOOD FLOORING .....	40
09651	RESILIENT FLOORING - CEMENTITIOUS UNDERLAYMENT .....	41
09660	RESILIENT FLOORING .....	43
09670	FLUID-APPLIED RESILIENT FLOORING .....	48
09675	CONDUCTIVE VINYL TILE FLOORING .....	49
09680	CARPETING .....	51



## Table of Contents

09720	EPOXY FLOORING .....	56
09730	BLUE STONE STAIR TREADS .....	59
09731	CONDUCTIVE ELASTOMERIC LIQUID FLOORING .....	62
09740	HEAVY-DUTY CONCRETE FLOOR TOPPING .....	64
09741	ARMORED FLOORING .....	65
09750	BRICK FLOORING .....	66
09751	LIGHT-DUTY BRICK FLOORING .....	69
09770	STANDARD FLOOR TREATMENT .....	71
09771	FLOOR TREATMENT NON-SLIP COATINGS ON CONCRETE FLOORS .....	73
09772	FLOOR TREATMENT - REFINISHING WOOD FLOORS .....	74
09775	SOAPSTONE .....	76
09800	SPECIAL WALL COATING .....	83
09900	PAINTING .....	87
09950	WALL COVERINGS .....	104
09956	CORNER GUARDS .....	106

## 10000 Specialties 10 - 1

10150	COMPARTMENTS AND CUBICLES FOR SHOWER AND TOILET ROOMS .....	1
10290	PEST CONTROL .....	5
10350	FLAGPOLES .....	6
10410	DIRECTORIES, CHALKBOARD, CORKBOARD, COATING AND TRIM .....	9
10440a	OVERPASS SIGNS .....	11
10440b	REFLECTORIZED SIGNS .....	13
10440c	TRAFFIC SIGNAL SUPPORT SYSTEM .....	16
10440d	SIGNS .....	21
10440e	ALUMINUM FLAG SIGNS .....	23
10440f	SHEET ALUMINUM SIGNS .....	27
10440g	NONILLUMINATED FIBERGLASS SIGNS .....	31
10440h	ILLUMINATED FIBERGLASS SIGNS .....	36
10440i	ILLUMINATED EMERGENCY EXIT SIGNS IN FIBERGLASS SIGNS .....	41
10440j	ALUMINUM HEADERS FOR INTERIOR & EXTERIOR CASES .....	43
10440k	ACRYLIC SIGNS .....	47
10440l	BRAILLE SIGNS .....	50
10440m	DECALS .....	53
10440n	INDIVIDUAL LETTER SIGNS .....	55
10440o	ORIGINAL FIBERGLASS PYLON RETROFIT .....	59
10440p	ORIGINAL FIBERGLASS PYLON RETROFIT .....	62
10440q	PLATFORM STRIP SIGNS .....	65
10440r	SILKSCREENED GRAPHICS .....	68
10440s	BREAKFORMED ALUMINUM TUBES .....	70
10440t	VINYL DIE CUT GRAPHICS .....	74
10450	METAL DETECTORS .....	76
10500	METAL LOCKERS .....	77
10520	FIRE EXTINGUISHERS, CABINETS, AND ACCESSORIES .....	80
10551	MAIL CHUTES .....	81
10610	DEMOUNTABLE PARTITIONS .....	82
10617a	MOVEABLE METAL PARTITIONS .....	84
10617a	MOVEABLE & DEMOUNTABLE PARTITIONS .....	85
10618	WIRE MESH PARTITIONS .....	88
10800	TOILET & BATH ACCESSORIES .....	91
10900	WOOD WARDROBES .....	94

## 11000 Equipment 11 - 1

11111	OFFICE EQUIPMENT .....	1
11181	TELEMETRY EQUIPMENT .....	4
11191	SECURITY EQUIPMENT .....	6
11400	FOOD SERVICE EQUIPMENT .....	8
11415	UNIT KITCHENS .....	71



## Table of Contents

11510	GYMNASIUM EQUIPMENT.....	72
11525	FIXED WOOD BLEACHERS (EXTERIOR).....	80
11526	DEMOUNTABLE BLEACHERS (EXTERIOR) .....	81
11630a	CLOTHES DRIERS.....	82
11630b	CLOTHES WASHERS.....	83
11871	PLATFORM AND DOCK LEVELERS .....	84
11873	PLATFORM AND DOCK LIFTS .....	86
11874	PLATFORM AND DOCK ENCLOSURES .....	87
11875	PLATFORM AND DOCK BUMPERS.....	88
11876	PLATFORM AND DOCK WARNING DEVICES .....	89
11877	PLATFORM AND DOCK GUARDRAILS AND POSTS.....	90

## 12000 Furnishings 12 - 1

12511	ROLL-UP SHADES .....	1
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## 13000 Special Construction 13 - 1

13150	ACCESS AND PEDESTAL FLOORS.....	1
13600	PRE-ENGINEERED STRUCTURES .....	3
13850	SWIMMING POOL ACCESSORIES .....	8

## 14000 Conveying Systems 14 - 1

14200	ELEVATOR WELL .....	1
14204	PASSENGER ELEVATORS .....	3
14210	FREIGHT ELEVATORS.....	5
14300	CRANES AND HOISTS .....	7
14400	LIFTS .....	8
14401	PERSONNEL LIFTS .....	10
14402	CHAIR LIFTS .....	12
14403	VEHICULAR LIFTS.....	13
14404	ASH HOISTS.....	14
14501	AUTOMATIC CART TRANSPORTATION SYSTEMS.....	15
14564	TRASH CHUTES .....	16

## 15000 Mechanical 15 - 1

15043	TESTING AND BALANCING OF HVAC SYSTEMS .....	1
15060	MECHANICAL PIPING.....	4
15100	VALVES .....	10
15120	MECHANICAL PIPING ACCESSORIES.....	24
15141	PUMPS .....	32
15161	VIBRATION ISOLATION .....	34
15173	METERS AND GAGES.....	38
15176	STEEL TANKS .....	45
15177	FIBERGLASS TANKS.....	47
15182	INSULATION FOR ABOVEGROUND PIPE .....	48
15183	INSULATION FOR UNDERGROUND PIPE .....	51
15184	BOILER FIREBOX INSULATION .....	52
15190	DUCTWORK INSULATION .....	55
15320	GREASE INTERCEPTORS .....	58
15400	INTERIOR PLUMBING.....	59
15470	POOL EQUIPMENT .....	67
15500	FIRE PROTECTION SYSTEMS .....	73
15605	FUEL HANDLING SYSTEMS.....	78
15620	HIGH TEMPERATURE WATER BOILERS .....	80
15621	CAST-IRON BOILERS AND FIREBOXES .....	82



## Table of Contents

15623	SCOTCH MARINE BOILERS .....	85
15624	WATER TUBE BOILERS .....	93
15625	FIRE TUBE BOILERS .....	96
15639a	BOILER ACCESSORIES .....	99
15639b	BOILER FEEDWATER EQUIPMENT .....	106
15639c	CLEANING OF BOILERS .....	109
15639d	FIREBRICK FIREBOXES FOR BOILERS .....	112
15639e	FIREBRICK FOR INSULATION OF BOILER FIREBOXES .....	114
15645a	OIL-FIRED AND GAS-FIRED BURNERS FOR BOILERS .....	115
15645b	COAL-FIRING SYSTEMS FOR BOILERS .....	117
15645c	GAS UNIT HEATERS .....	118
15645d	OIL UNIT HEATERS .....	120
15650	REFRIGERANT EQUIPMENT .....	121
15661	CONDENSERS .....	125
15674	CENTRIFUGAL CHILLERS - WATER COOLED .....	127
15681a	NATURAL DRAFT COOLING TOWERS .....	135
15681b	FORCED DRAFT AND INDUCED DRAFT COOLING TOWERS .....	137
15699	REFRIGERATION SPECIALTIES .....	139
15715a	STEAM AND HOT WATER UNIT HEATERS .....	140
15715b	CLEANING OF HEAT EXCHANGERS .....	142
15715c	CLEANING AND TREATMENT OF HOT AND/OR CHILLED WATER SYSTEM .....	143
15732	CONVERTERS .....	144
15741	INDUCTION UNITS .....	146
15745	RADIATORS AND CONVECTORS .....	147
15750	COILS .....	150
15760	ELECTRIC UNIT HEATERS .....	153
15770a	PACKAGED HEATING AND COOLING UNITS .....	154
15770b	ROOFTOP HEATING AND COOLING UNITS .....	155
15772	PACKAGED HEAT PUMPS .....	160
15781	HUMIDITY CONTROL EQUIPMENT .....	161
15810	WARM AIR FURNACES .....	162
15821	CENTRIFUGAL FANS .....	164
15827	AXIAL FLOW FANS .....	166
15830	POWER ROOF VENTILATORS .....	167
15834	AIR HANDLING UNITS .....	169
15840	DUCTWORK AND ACCESSORIES .....	170
15851	TAILPIPE EXHAUST EQUIPMENT .....	174
15855a	BREECHING .....	176
15855b	STACKS .....	178
15866	DRAFT CONTROL EQUIPMENT .....	180
15871	DIFFUSERS AND GRILLES .....	182
15880	AIR CLEANING DEVICES .....	186
15890	SOUND ATTENUATORS .....	189
15900a	CONTROL DEVICES FOR MECHANICAL EQUIPMENT .....	190
15900b	ENERGY MANAGEMENT .....	192
15915	COMPRESSED AIR EQUIPMENT .....	195
15937	CONTROL AND FIRE DAMPERS .....	197

## 16000 Electrical

16 - 1

16050	WIRING SYSTEMS EQUIPMENT .....	1
16120	WIRE, CABLE AND WIRING (600 VOLT MAXIMUM) .....	2
16131	PULL AND JUNCTION BOXES .....	5
16160	PANELBOARDS .....	7
16175	SAFETY SWITCHES .....	10
16176	WIREWAYS .....	12
16181	FUSES (UP TO 600 VOLTS) .....	14
16190	SUPPORT DEVICES .....	16
16195	ELECTRICAL IDENTIFICATION .....	18
16211	MOTOR GENERATOR SETS .....	22
16252	UNINTERRUPTIBLE POWER SYSTEM (UPS) .....	23



## Table of Contents

16300	ELECTRICAL DISTRIBUTION SYSTEM SUBSTATION EQUIPMENT .....	24
16330	TRANSFORMERS .....	26
16411	UNDERGROUND ELECTRICAL DISTRIBUTION SYSTEMS .....	29
16413	OVERHEAD ELECTRICAL DISTRIBUTION SYSTEMS.....	31
16431	ELECTRICAL DISTRIBUTION SYSTEM CAPACITOR BANKS .....	32
16432	ELECTRICAL DISTRIBUTION SYSTEM VOLTAGE REGULATORS.....	33
16450	ELECTRICAL DISTRIBUTION SYSTEM GROUNDING .....	34
16460	ELECTRICAL DISTRIBUTION TRANSFORMERS .....	35
16461	DRY TYPE TRANSFORMERS.....	36
16471	PANELBOARDS AND LOAD CENTERS.....	40
16480	ELECTRIC MOTORS.....	41
16491	HIGH-VOLTAGE DISCONNECTING DEVICES.....	44
16492	INTERIOR LOW-VOLTAGE DISCONNECTING DEVICES.....	45
16524	STREET AND AREA LIGHTING CONTROLS.....	47
16535	INTERIOR SWITCHGEAR, LOW-VOLTAGE .....	48
16570	POLES FOR STREET AND AREA LIGHTING SYSTEMS.....	53
16590	SPECIAL LIGHTING .....	55
16595a	BALLASTS AND TRANSFORMERS.....	62
16595b	LUMINAIRES.....	63
16620	EMERGENCY LIGHTING SYSTEMS .....	65
16640	CATHODIC PROTECTION OF STEEL WATER TANKS.....	68
16641	CATHODIC PROTECTION SYSTEM FOR UNDERGROUND UTILITIES .....	71
16670	LIGHTNING ARRESTERS .....	74
16680	DIESEL- ENGINE GENERATOR SET .....	75
16721	FIRE ALARM AND DETECTION EQUIPMENT.....	84
16722	CARD ACCESS CONTROL SYSTEM .....	86
16730	CLOCK AND PROGRAM SYSTEMS .....	87
16770	PUBLIC ADDRESS EQUIPMENT .....	88
16850	INSTITUTIONAL ELECTRIC HEATING EQUIPMENT.....	90
16851	ELECTRIC UNIT HEATERS.....	91
16859	ATHLETIC FIELD SOUND SYSTEM and PORTABLE SOUND AMPLIFIER .....	92
16900	CENTRAL MONITORING, CONTROL, AND INSTRUMENTATION .....	98

END OF Table Of Contents



## SECTION 01660a

### PRECISION TESTING OF UNDERGROUND FUEL OIL TANKS

- 1.0 Description of Work: This specification covers the Precision testing of underground fuel oil tanks. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 NOT USED
- 3.0 EXECUTION:
  - 3.1 The Contractor shall furnish all the necessary labor and equipment to complete the Precision Fuel Oil Tank Testing at various buildings under the jurisdiction of the Corpus Christi Army Depot. The pertinent quantity and the capacity of the tanks will be listed on each Job Order. When the contractor elects to use a volumetric tank tester, he shall be responsible to fill up and "top off" tank to a maximum of 100 gallons prior to the start of testing. The cost to "top off" tank will be the contractors responsibility.
  - 3.2 The Contractor shall provide the material and labor necessary for the drilling and tapping of the existing oil tank manhole cover and the installation of new air bleeder valves. The air bleeder valve shall be a Hoffman Specialty #40 or #41 of their approved equal.
  - 3.3 COORDINATION OF WORK:

Prior to performing any test, the contractor shall notify the Contracting Officer of the scheduled test date. Designated personnel from the Corpus Christi Army Depot shall take necessary actions to coordinate fuel oil delivery and shall inform the contractor of the date and time of the fuel delivery. The contractor shall ascertain that the tanks are filled to capacity and shall be responsible to have the tanks "topped off" up to a maximum of 100 gallons prior to the start of testing. The contractor shall make arrangements to perform the testing within forty-eight (48) hours of notification that the oil tank has been filled. The Contractors responsibility to "top off" tank only applies when the contractor elects to utilize a volumetric tank tester.
  - 3.4 TEST EQUIPMENT:

The Contractor shall be limited to using the following state approved Precision Testing methods:

    - Ainlay Tank Tegrity Tester
    - Horner EZY 3
    - Hunter Leak Lokator
    - Tank Auditor
    - Petro Tite
  - 3.5 TEST RESULTS

The Contractor will be required to submit written reports of test results as noted below.

    - a) The test reports' format shall be approved by the testing equipment manufacturer and the state.



## 01000 - General Requirements

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- b) The Contractor shall submit one (1) type written report within seven (7) days of completion of the testing to the Contracting Officer.
- c) The Contractor shall submit one copy of the report to the state within thirty (30) days of completion of the testing. Proof of submission shall be appended to the request for payment.
- d) The test results shall include, but not be limited to:
  - 1. Name and/or Number of Building
  - 2. Address of Building
  - 3. Date and Time of Test
  - 4. Results of test including (Actual Data Calculations Graphs)
  - 5. Test Method
  - 6. Name and address of Contractor
  - 7. Signature of test technician
- e) Should the test indicate a leakage condition, the contractor shall perform the following:
  - 1. Initiate procedure to isolate piping from tank and determine the source of the leak. This work shall be performed after notification of the Contracting Officer.
  - 2. Submit a written proposal and cost estimate for work required to be performed to repair leak. Recommended proposal shall be submitted to Corpus Christi Army Depot within 48-hours after determining source of leak. No repair work shall proceed without authorization by the Contracting Officer.
  - 3. Notify the state of leak discovered in underground buried tank. This notification shall take place within 2 hours of determining source of leak.
  - 4. In these cases, the Corpus Christi Army Depot may direct the Contractor to complete the work or exercise its option to perform the required work by its own forces or under separate contract.
- f) After completion of the remedial work when applicable, the contractor shall perform a re-test, and shall issue a final test report in aforementioned format. The contractor shall be paid 50% of the bid unit price for the re-test.

END OF SECTION 01660a



## SECTION 01660b

### HYDROSTATIC PRESSURE TESTING OF AIR RECEIVING TANKS

- 1.0 Description of Work: This specification covers the hydrostatic pressure testing of air receiving tanks. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 NOT USED
- 3.0 EXECUTION:
  - A. Disconnect all piping and remove safety valve from air receiving tank and temporarily plug all openings on the disconnected tank.
  - B. Perform hydrostatic test at not less than twice the charging pressure, at 70 degrees Fahrenheit, for fifteen (15) minutes in accordance with the Administrative Code of Corpus Christi Army Depot.
  - C. Test shall be performed in the presence of a representative of the Inspection Unit. Contractor Shall notify the Inspection Unit at (718) 391-6148 seventy-two (72) hours prior to test.
  - D. At the completion of each test, contractor shall reconnect all piping and reinstall all removed equipment.
  - E. The contractor shall issue a affidavit of test to the Project Manager. The affidavit shall state the date of test, testing pressure and the maximum working pressure allowable until the next test.
  - F. Furnish and install a glass enclosed aluminum frame of suitable size to display affidavit. Frame shall be open at the top for easy access to affidavit. Frame shall be firmly affixed in a permanent location adjacent to receiver tank as directed by the Project Manager.
- 3.1 INTENT:
  - A. Pursuant to the provisions of Section C 19-11.0, C 19-18.0, C 19-90.0 and C 19-91.1-C of the Administrative Code of Corpus Christi Army Depot and in the interest of public safety, the Fire Commissioner requires that:
  - B. All compressed air tanks shall be tested by a person who has received a Certificate of Fitness from the fire Commissioner to conduct such a test in the manner and to the pressure set forth in Section C 19-91.1 -C of the code before being continued in use.
  - C. Licensed testers shall submit ten (10) day notice of appointments to the Fire Department.
  - D. A sworn statement by the person conducting the test improper affidavit form. attesting to the completion of such test shall be filed with the Fire Commissioner's office and a copy thereof posted on the premises.





## 01000 - General Requirements

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- E. The submission of such an affidavit or posting a copy thereof, where the required test has not been carried out in accordance with the foregoing provisions of law, shall be cause for the revocation of the Certificate of Fitness, denial of the required permits to maintain and operate equipment and may also subject the individual to criminal liability for filing a false affidavit and a fine of up to five hundred dollars, imprisonment of up to six months. or both.

END OF SECTION 01660b

END OF SPECIFICATION SECTION 01 – General Conditions



## SECTION 02010

### STANDARD PENETRATION TESTS

- 1.0 DESCRIPTION OF WORK: This specification covers core drilling and borings for subsurface investigation of soils.
- 2.0 PRODUCTS: (Section not used.)
- 3.0 EXECUTION:
  - 3.1 Auger Borings: ASTM D 1452
  - 3.2 Soil Samples: ASTM D 1586, ASTM D 1587
  - 3.3 Rock Cores: ASTM D 2113, Size BX and NX.
  - 3.4 Bearing Capacity: ASTM D 1149.
  - 3.5 Soils Classification: ASTM D 2487, D 2488, MIL-STD-619
  - 3.6 Boring Logs: Boring report shall include, but not be limited to, a boring location plan locating and numbering boring and boring logs. Log of borings shall have boring number; date of start and finish of boring; rig type, job number and name; sample number, depth, and type; depth of strata changes, soil description and classification, surface elevation, depth of boring, and depth of water table.

END OF SECTION 02010



## SECTION 02102

### CLEARING AND GRUBBING

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing of labor and equipment for clearing and grubbing.
- 2.0 PRODUCTS (Section not used)
- 3.0 EXECUTION:
  - 3.1 Remove all trees and shrubbery unless otherwise indicated or prohibited, and all stumps, roots, foundation walls, rubbish and all other materials and encumbrances of every name and nature now on the premises or that may be found in excavating. Roots shall be grubbed out to at least 18 inches below existing surface. Tree roots shall be cut at the grading limits line with a Ditch Witch or similar equipment prior to grading. Cleared items shall be removed from the site or otherwise disposed of in an environmentally acceptable manner.
  - 3.2 Trees and shrubs that are not to be removed shall be protected from damage to the satisfaction of the Contracting Officer.
  - 3.3 Any existing wells, cesspools or privy vaults shall be thoroughly cleaned out, disinfected and filled in as directed by the Contracting Officer.
  - 3.4 Any existing water, gas or sewer pipes, or electrical lines or conduits, which are no longer required, shall be disconnected at the mains and the openings in the mains shall be closed in the proper manner in accordance with the regulations of Municipal Agencies having jurisdiction. Certificate of compliance shall be obtained by the Contractor and copies forwarded to the Contracting Officer.
  - 3.5 Disposal of materials: All felled timber, logs, stumps, roots, brush, rotten wood, and other refuse from the clearing and grubbing operations shall be disposed of in compliance with all federal, state, and local regulations.

END OF SECTION 02102



## SECTION 02110

### DEMOLITION SELECTED ITEMS

- 1.0 DESCRIPTION OF WORK: This specification covers the demolition of selected items from selected areas as required to support other work or as directed by the Contracting Officer.
- 1.1 Submit a schedule indicating proposed methods and sequence of operations for selective removals and demolition work prior to commencement of operations. Include details for dust and noise control operations. Provide a detailed sequence of removals and demolition work to ensure uninterrupted progress of normal activities.
- 1.2 Protections:
  - 1.2.1 Provide temporary barricades and any other protective measures as required so as to allow free and safe passage to all authorized personnel through demolition area.
  - 1.2.2 Protect floors with building paper or other suitable covering.
- 2.0 PRODUCTS: (Not Used)
- 3.0 EXECUTION:
  - 3.1 Perform selective demolition work in a systematic manner.
  - 3.2 Remove debris, rubbish and other materials immediately; transport and legally dispose of materials off-site. Disposal method shall be in accordance with the Corpus Christi Army Depot, State of Texas and appropriate Federal regulations.
  - 3.3 Burning of removed materials is not permitted on the job site.
  - 3.4 All reusable equipment, materials, and items removed shall be the property of the Contracting Officer if desired. Equipment material and items not desired to be re-used or retained by the Contracting Officer shall be removed from the site by the Contractor.

END OF SECTION 02110



## SECTION 02113

### ASBESTOS ABATEMENT

- 1.0 Description Of Work: This specification covers the removal, encapsulation, and/or enclosure of building materials that have been determined to contain asbestos. The work shall comply with Title 29, CFR, Sections 1910.1001 and 1910.134, OSHA, Department of Labor, and with Title 40, CFR, Part 61, Subparts A and B, National Emission Standards for Hazardous Air Pollutants, EPA, Texas State and Local laws and regulations.
- 1.1 Plan of Action: The Contractor shall submit a detailed plan of the procedures he intends to use. The plan shall include the location and layout of decontamination area, the sequencing of asbestos work, the interface of trades involved in the performance of work, the methods to be used to assure the safety of other contractors and visitors to the site, a disposal plan including location of approved disposal site with copy of land use permit, and a detailed description of the methods to be employed to control pollution. The plan must be accepted by the Contracting Officer prior to commencement of work.
- A. Work performed on each proceed Order shall be guaranteed for labor materials, and standards of quality acceptable to the Contracting Officer for a period of one year from the date of completion.
  - B. The Contractor shall not be held liable for the guarantee where the repair required under the guarantee is a result of obvious abuse or vandalism occurring after completion of the work at a particular site or location.
  - C. Contracting Officer will notify the Contractor in writing regarding defects in work under the guarantee, giving site, location and Order number under which the work was previously performed.
- 1.01 Description of Work Included: Furnish all labor, materials, operations, equipment and incidentals necessary to complete the work as specified. The work includes, but is not limited to the following:



1. Protective clothing (suits and masks)
  2. Plastic barriers (erection and maintenance)
  3. Caution signs
  4. Employment of negative-air pressure equipment
  5. Scaffolding
  6. Cleaning (visually)
  7. Asbestos insulation removal
  8. Asbestos disposal
  9. Replacement of insulation (non-asbestos)
  10. Encapsulation, Structural Containment, Plaster Patching or Sealing.
  11. Removal and replacement of soft asbestos-containing material.
  12. Glove bag or tent removal.
- 2.02 Location of work: Various sites within Corpus Christi Army Depot and such other locations as may be designated by the Contracting Officer. Notification will be made by Corpus Christi Army Depot in the form of a work order.
- 2.03 Job Meeting: Prior to starting, the Contractor must notify the Contracting Officer in order that a job meeting be set up at the site, if the Contracting Officer requests.

Following this initial job meeting, it shall be the Contractor's responsibility to notify the Contracting Officer of his proposed work schedule, and the specific areas in which he plans to work.
- 3.01 Description:
  - A. Work Included:
    1. Throughout the specifications, reference is made to codes and standards which establish methods, protocols, qualities and types of workmanship and materials, and which establish methods for testing and reporting on the pertinent characteristics.
    2. Where materials or workmanship are required by these specifications to meet or exceed the specifically named code or standard, it shall be the Contractor's responsibility to provide materials and workmanship which meet or exceed the specific code or standard.
    3. It shall be the Contractor's responsibility, when so required by the Specifications or by written request from the Contracting Officer, to deliver to the Contracting Officer all required proof that the materials or workmanship, or both, meet or exceed the requirements of the specifically named code or standard. Such proof shall be in the form requested.
  - B. Related Work Specified Elsewhere:

Specific naming of codes or standards occurs in other Sections of these Specifications.
- 3.02 Quality Assurance:
  - A. Familiarity With Pertinent Codes and Standards: In procuring all items used in this work, it shall be the Contractor's responsibility to verify the detailed requirements of the specifically named codes and standards and to verify that the items procured for use in this work meet or exceed the specified requirements.



## 02000 - Site Work

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- B. Rejection of Non Complying Items: Contracting Officer reserves the right to reject items incorporated into the work which fail to meet the specified minimum requirements. Contracting Officer further reserves the right, and without prejudice to other recourse they may take, to accept non-complying items subject to an adjustment in the Contract amount as approved by the Contracting Officer.
- C. Applicable Standards: Applicable standards listed in these Specifications include, but are not necessarily limited to, standards promulgated by the following agencies and organizations:
  - 1. EPA - Environmental Protection Agency  
Part 61, Sub-Parts A and B  
National Emission Standard for Asbestos
  - 2. OSHA - Occupational Safety and Health Act  
Paragraph 1926.58 - Asbestos
  - 3. NEC - National Electrical Code (See NFPA)
  - 4. NFPA - National Fire Protection Association  
470 Atlantic Avenue, Boston, Ma. 02201
  - 5. NIOSH - National Institute for Occupation Safety and Health  
26 Federal Plaza, N.Y.,N.Y. 10007  
(212) 264 - 2485
  - 6. Fed. Specs. - Specifications Sales (3F21) Bldg. 197,  
Washington, D.C. 20407
  - 7. ANSI - American National Standards Institute  
(Successor to USASI and ASA)  
1430 Broadway, N.Y.,N.Y. 10018
  - 8. ASTM - American Society for Testing and Materials  
1916 Race Street  
Philadelphia, Pa. 19103
  - 9. U.S.T. regulations and standards for dealing with existing and new underground storage tanks, and above ground storage tanks when so specified.

### 4.01 Description:

- A. Work Included: Temporary facilities and controls required for this work include, but are not necessarily limited to:
  - 1. Clean room located conveniently to work areas.
  - 2. Enclosure of work areas, and negative air pressure machines.
  - 3. Caution signs.
  - 4. Shower facilities, located between work areas and clean room on Removal Projects, where more than 260 lineal feet of pipe insulation or more than 160 sq. ft. of removal is involved.
  - 5. Scaffolding.
  - 6. Visual barriers between work areas and other building areas, when adjacent areas are occupied during course of work.
  - 7. Negative-Air pressure equipment.
- B. Related Work Specified Elsewhere: Except that all equipment furnished by sub-contractors shall comply with all requirements of pertinent safety regulations, the ladders planks, hoists, and



similar items normally furnished by the individual trades in execution of their own portions of the work are not part of this Section.

- |   |                |
|---|----------------|
| 1. Cleaning   | Section Five   |
| 2. Removal of Asbestos Containing Material(When included) | Section Six    |
| 3. Encapsulation(When Included)                           | Section Eight  |
| 4. Structural Containment (When Included)                 | Section Nine   |
| 5. Sealing of Acoustic Plaster(When Included)             | Section Ten    |
| 6. Removal of Asbestos Boiler and Pipe Insulation         | Section Twelve |
| 7. Underground storage tank related work                  |                |

4.02 Materials:

- A. Respiratory protection shall be worn by all individuals inside the work area from the initiation of the asbestos project until all areas have successfully passed clearance air monitoring in accordance with these Specifications.
- a. All respiratory protection shall be MSHA/NIOSH approved in accordance with the provisions of 30 CFR Part II. All respiratory protection shall be provided by the contractor, and used by workers in conjunction with the written respiratory protection program.
- b. The Contractor shall provide respirators selected by and Industrial Hygienist that meet the following Requirements:
1. Full facepiece Type C supplied-air respirators operated in pressure demand mode equipped with an auxiliary positive pressure self-contained breathing apparatus shall be worn during gross removal, demolition renovation and/or other disturbance of ACM whenever airborne fiber concentrations inside the work area are equal to or greater than 10.0 f/cc.
  2. Full facepiece Type C supplied-air respirators operated in pressure demand mode with HEPA filter disconnect protection shall be worn during gross removal, demolition, renovation and/or other disturbance of IACM with and amphibole content and/or whenever airborne fiber concentrations inside the work areas are equal to or greater than 2.0 f/cc and less than 10.0 f/cc.
  3. Full facepiece powered air-purifying respirators (PAPR) equipped with HEPA filters shall be worn during the removal, encapsulation, enclosure, repair and/or other disturbance of friable ACM whenever airborne fiber concentrations inside the work area are equal to or greater than 0.1 f/cc and less than 2.0 f/cc. A supply of charged replacement batteries, HEPA filters and flow test meter shall be available in the clean room for use with powered air-purifying respirators. HEPA filters shall be changed daily or as flow testing indicates change is necessary  
  
Any Type C supplied-air respirator operated in continuous flow may be substituted for a powered air-purifying respirator.
  4. Half-mask or full face air-purifying respirators with HEPA filters shall be worn only during the preparation of the work area, performance of repairs (e.g. using glovebag techniques)and final clean up procedures provided airborne fiber concentrations inside the work area are less than 0.1 f/cc.
  5. Use of single dust respirators is prohibited for the above respiratory protection.





## 02000 - Site Work

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- c. Workers shall be provided with personally issued and individually marked respirators. Respirators shall both be marked with any equipment that will alter the fit of the respirator in any way. Only waterproof identification markers shall be used.
  - d. The Contractor shall ensure that the workers are qualitatively or quantitatively fit tested by and Industrial Hygienist initially and every 12 months thereafter with the type of respirator he/she will be using.
  - e. Whenever the respirator design permits, workers shall perform the positive and negative air pressure fit test each time a respirator is worn. Powered air-purifying respirators shall be tested for adequate flow as specified by the manufacturer.
  - f. No facial hairs (beards) shall be permitted to be worn when wearing respiratory protection that requires a mask-to-face seal.
  - g. Contact lenses shall not be worn in conjunction with respiratory protection on asbestos projects.
  - h. If a worker wears glasses, a spectacle kit to fit their respirator shall be provided by the Contractor at the Contractor's expense.
  - i. Respiratory protection maintenance and decontamination procedures shall meet the following requirements:
    - 1. Respiratory protection shall be inspected and decontaminated on a daily basis in accordance with OSHA 29 CFR1910.134(b); and
    - 2. HEPA filters for negative pressure respirators shall be changed after each shower; and
    - 3. Respiratory protection shall be the last piece of worker protection equipment to be removed. Workers must wear respirators in the shower when going through decontamination procedure as stated, and
    - 4. Airline respirators with HEPA filtered disconnect shall be disconnected in the equipment room and worn into the shower. Powered air-purifying respirator facepieces shall be worn into the shower. Filtered/power pack assemblies shall be decontaminated in accordance with manufacturers recommendations; and
    - 5. Respirators shall be stored in a dry place and in such a manner that the facepiece and exhalation valves are not distorted; and
    - 6. Organic solvents shall not be used for washing of respirators.
  - j. Authorized visitors shall be provided with suitable respirators and instruction on the proper use of respirators whenever entering the work area. Qualitative fit test shall be done to ensure proper fit of respirator.
- B. Disposable Clothing: manufactured of "Tyvek" by Dupont, or approved equal.
- C. Wetting Agents: "Asbestos-Wet" - Aquatrols Corp. of America or approved equal.
- D. Vacuum: HEPA type equal to "Nilfisk" #GA73, or "Pullman/Holt" #75 ASA.
- E. Polyethylene Bags: Six mil (.006") thick - with warning label.



- F. Plastic Barriers: Six mil (.006") as specified in this section.
- G. Negative-Air Pressure Equipment: shall be in compliance with ANSI Z9.2(1979) local exhaust ventilation.
  - 1. The negative pressure ventilation equipment shall operate continuously, 24 hours a day, from the establishment of isolation barriers through successful clearance air monitoring. If such equipment shuts off, adjacent areas shall be monitored for asbestos fibers.
  - 2. A static negative air pressure of 0.02 inches (minimum) water column shall be maintained at all times in the work place during abatement to ensure that contaminated air in the work area does not filter back to uncontaminated areas.
  - 3. If more than one ventilation unit is installed, units shall be turned on one at a time while checking the integrity of all barriers for secure attachment and the need for additional reinforcement.
  - 4. A dedicated power supply for the negative pressure ventilation units shall be utilized.
  - 5. On loss of negative pressure or electric power, abatement shall stop immediately and shall not resume until power is restored and negative pressure ventilation equipment is operating again. When power failure or loss of negative pressure equipment lasts or is expected to last longer than one hour:
    - a. The make-up air inlets shall be airtight, and
    - b. the decontamination system shall be sealed airtight after the evacuation of workers and/or authorized visitors from the work area, and
    - c. all adjacent areas shall be monitored for asbestos fiber concentration upon discovery of, and subsequently throughout, the power failure.
  - 6. Negative pressure ventilation equipment shall be installed and operated to provide at least one air change in the work area every 15 minutes, except during clearance air monitoring when at least one air change in the work area every 30 minutes shall be provided.
  - 7. Additional make-up air may be delivered to the work area through horizontal shutters which open on make-up air inflow and seal on air flow cessation, or delivered through a HEPA-filtered ventilation system.
  - 8. Openings made in the isolation barrier to accommodate these units shall be made airtight. The units shall remain within the work area unless located securely outside the building.
  - 9. Negative air pressure systems shall be operated in accordance with: Specification and Operating Procedures for the Use of Negative Pressure Systems for Asbestos Abatement," Guidance for Controlling Asbestos-Containing Materials in Buildings, EPA Report Number 560/5-85-024 (1985).
  - 10. Negative pressure ventilation equipment shall be exhausted to the outside of the building away from occupied areas.
    - a. At no time shall the negative pressure ventilation unit exhaust within 40 feet of a receptor or adversely affect the air intake ports, louvers, or entrances for the building or adjacent buildings.



## 02000 - Site Work

- b. Heavy duty ducting of equivalent, or larger, shape and dimension as that of the negative pressure ventilation exhaust port shall be used to exhaust to the outside of the structure.
    - c. All ducting shall be sealed and braced or supported to maintain airtight joints.
  - 11. Where ducting to the outside is not possible, a second negative pressure ventilation unit compatible with the primary unit's capacity shall be connected in series. The area receiving the exhaust shall have sufficient, non-recycling exhaust capacity to the outside of the structure.
  - 12. Careful installation shall be done to ensure that the ducting does not release fibers into uncontaminated building areas.
  - 13. Routing smoke testing, air monitoring and daily inspections shall be performed by the Asbestos Handler Supervisor to ensure that the ducting does not release fibers into uncontaminated building areas.
- 4.03 Product Handling: Use all means necessary to maintain temporary facilities and controls in proper and safe condition throughout progress of the work.
- 4.04 Workers Dress and Equipment:
- A. Disposable Clothing: Each worker shall be supplied with at least two (2) complete disposable uniforms per day for the entire period of asbestos abatement work.
    - 1. Work clothes will consist of disposable full body coveralls, head covers, gloves, foot covering and respiratory protective equipment should be available as appropriate.
    - 2. Coveralls should be of a "Tyvek" disposable type.
    - 3. In addition to uniforms for workers, the Contractor shall have on hand four (4) additional uniforms each day for personnel who are authorized to inspect the work site.
  - B. Caution Signs: The Contractor shall post signs in accordance with OSHA 29 CFR 1926.58(K) Sign Specifications. Signs shall be posted at all approaches to the work place including internal doorways which provide access to the work place. These signs shall bear the following information:

DANGER

ASBESTOS

CANCER AND LUNG DISEASE HAZARD

AUTHORIZED PERSONNEL ONLY

RESPIRATORS AND PROTECTIVE

CLOTHING

ARE REQUIRED IN THIS AREA
- 4.05 Utilities:
- A. General: All temporary facilities shall be subject to the approval of the Contracting Officer.



- B. Water: Contracting Officer will furnish all water needed for construction, at no cost to the Contractor.
- C. Electricity: Contracting Officer will furnish all electricity for construction at no cost to the Contractor.

4.06 (not used)

4.07 Signs:

- A. Project Signs: Allow no signs or advertising of any kind on the job site except as specified herein.
- B. Caution Signs:
  - 1. Posting: Caution signs shall be provided and displayed at all approaches and entrances to work areas.
- C. Caution Labels:
  - 1. Labeling:

Labels shall be affixed to all bags and containers which are to be filled with asbestos waste material to be disposed of as part of the work of this contract.
  - 2. Specifications:

Labels shall be printed in letters of sufficient size and contrast to be readily visible and legible. The label shall state:

DANGER

Contains Asbestos Fibers

Avoid Creating Dust

Cancer and Lung Disease Hazard

4.08 Erection of Plastic Barriers:

- A. Plastic barriers of thickness specified in Paragraph 2.7 of this Section shall be erected by Contractor to totally enclose work areas. Barriers shall cover walls, floors and equipment. Barriers must be maintained during progress of the work.
- B. Fixed objects which will remain within the proposed work areas shall be pre-cleaned using HEPA filtered vacuum equipment and/or wet cleaning methods as appropriate, and enclosed with (two layers of) 6-mil plastic sheeting sealed (with tape) to protect from re-contamination.
- C. Duct tape may be used to attach vertical plastic barriers to walls and to floor. All edges of plastic material shall overlap the adjoining sheet a minimum of four inches. All joints (vertical and Horizontal) to be continuously sealed with tape. Cover all H. and V. supply and exhaust grilles. Spray adhesive may be used in lieu of tape.
- D. Movable furniture and equipment will be removed from work areas by Contractor prior to start of work in accordance with Section 6.06. At the conclusion of the work (after final air testing), the Contractor will reinstall furniture and equipment. Remove and store all curtains and drapes, and reinstall same following final clean-up.



## 02000 - Site Work

- 4.09 Temporary Shower Facility: Contractor shall construct temporary shower facility between work areas and clean room for removal and encapsulation projects.
- a. The shower room:
    - 1. Shall contain a minimum of one shower per 8 workers calculated on the basis of the largest shift, and
    - 2. Shall have shower heads supplied with hot and cold water adjustable at the (tap) shower, and
    - 3. Shall be constructed to ensure against water leakage, and
    - 4. Shall contain liquid bath soap, shampoo and clean, dry towels in sufficient quantity for each worker for each showering.
  - b. Rinse water shall be drained, collected and filtered through a system with at least 5.0 micron particle size collection capability; a system containing a series of several filters with progressively smaller pore sizes shall be used to avoid rapid clogging of the filtration system by large particles;
    - 1. Filtered wastewater shall be discharged either to a sewer or drummed and then properly disposed; and
    - 2. Used filters shall be disposed of as asbestos-containing waste material.
- 4.10 Visual Barrier:
- A. Contractor shall furnish and install material necessary to construct a temporary visual barrier outside of plastic barrier, when areas immediately beyond plastic barrier are occupied by during the progress of the work.
  - B. Temporary visual barrier shall be constructed of 2" x 3" wood stud (or metal) framing covered with 1/4" thick, 4' x 7' -hardboard. Smooth side of hardboard to be installed on clean area (occupied) side.
- 4.11 Maintenance and Removal:
- A. Maintain all temporary barriers facilities and controls as long as needed for the safe and proper completion of the work. Remove all such temporary facilities and controls as rapidly as progress of the work will permit, or as directed by the Contracting Officer.
  - B. No barriers are to be removed until all debris is properly bagged and carted from work areas and areas are thoroughly cleaned in accordance with provisions of Section Four.
- 4.12 Asbestos Identifying "Stop" Sign:
- A. On Asbestos Abatement Projects where asbestos containing material will remain at the conclusion of the work (i.e. encapsulation, containment, and sealing) yellow "Stop" stickers and arrows shall be applied by the Contractor in areas where he has performed work under this contract.
  - B. Obtain supply of stickers and arrows from the Contracting Officer.



- C. Unless otherwise directed by the Contracting Officer, apply stickers and arrows at 20' intervals in corridors (staggered on each wall), auditoriums, cafeterias, libraries and other spaces which are larger than normal room size.
- D. In normal size rooms or smaller rooms, apply a minimum of one sticker on short walls and two stickers on walls in excess of 20 feet.
- E. Stickers and arrows are to be applied on walls, approximately 12 inches below the ceiling surface.
- F. Arrows are to be applied in the direction of the asbestos containing material which remains at the conclusion of the work. (see sample herein)
- G. On Asbestos Abatement projects where asbestos containing material is removed and replaced, the Contractor shall remove any and all existing stop signs from walls in those areas.

5.01 DESCRIPTION:

- A. Work Included: Throughout the construction period, maintain the building and site in a standard of cleanliness as described in this Section.
- B. Related Work Specified Elsewhere: In addition to standards described in this Section, comply with all requirements for cleaning up as described in various other Sections of these Specifications.

5.02 Quality Assurance:

- A. Inspection: Conduct daily inspection, and more often if necessary, to verify that requirements of cleanliness are being met.
- B. Codes and Standards: In addition to the standards described in this Section, comply with all pertinent requirements of governmental agencies having jurisdiction.
- C. Contractor is required to notify all Federal, State and County regulating Offices prior to starting , for final regulations concerning proper disposal of asbestos waste material. A copy of this transmittal shall be forward to the City before/with final payment request. See Section Three, and paragraph 5.01-A.4.
- D. Disposal of Asbestos Waste: Notice to Contractors or carters who Do Not have permits to dump "Hazardous Waste": This procedure may take over a month to obtain the Proper permits. Therefore, it should be instituted immediately upon Award of an order against the contract.

5.03 Cleaning Materials and Equipment:

- A. Provide all required personnel, equipment , and materials needed to maintain the specified standard of cleanliness.
- B. Two layers of six mil (.006") polyethylene bags for material disposal.
- C. Thirty gallon capacity fiber drums, with lids.

5.04 Compatibility:



## 02000 - Site Work

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- A. Use only the cleaning materials and equipment which are compatible with the surface being cleaned, as recommended by the manufacturer of the material or as approved by the City
- B. Should vacuums be used, only H.E.P.A. type shall be permitted.

Note: Model #GA-73 by "NILFISK" and Model #75ASA by Pullman/Holt are approved for asbestos clean-up.

### 5.05 Progress Cleaning:

Note: All workers engaged in cleaning must wear approved respirators and other personal protection equipment specified in respective Sections of work.

- A. General:
  - 1. Retain all stored items in an orderly arrangement allowing maximum access, not impeding traffic, and providing the required protection of materials.
  - 2. Do not allow the accumulation of scrap, debris, waste material, and other items not required for completion of this work.
  - 3. At least weekly, and more often if necessary, completely remove all scrap, debris, and waste material from the job site.
  - 4. Provide adequate storage for all items awaiting removal from the job site, observing all requirements for fire protection and protection of the ecology.
- B. Work Areas:
  - 1. Daily, and more often if necessary, inspect the work areas and adjoining spaces, and pick up all scrap, debris, and waste material. Remove all such items to the place designated for their storage.
  - 2. Weekly, and more often if necessary, inspect all arrangements of materials stored on the site: restack, tidy, or otherwise service all arrangements to meet the requirements of subparagraph B.1 above.
  - 3. Maintain the site in a neat and orderly condition at all times.

### 5.06 Initial Cleaning:

- A. Visible accumulation of loose asbestos-containing waste material shall be cleaned up:
  - 1. whenever sufficient asbestos-containing waste material to fill a single leak-tight container of the type commensurate with the properties of asbestos-containing waste material has been removed, or
  - 2. at the end of each work shift, or
  - 3. once each working day, whichever shall occur first. Visible material shall be maintained wet until cleaned up.
- B. Accumulation of dust shall be cleaned off all surfaces of the work area on a daily basis, using HEPA vacuum or wet cleaning methods.
- C. The waste decontamination enclosure system shall be wet cleaned twice using wet cleaning methods upon completion of waste removal. When using the worker decontamination enclosure



shower room alternates as a waste container wash room, the shower room shall be washed immediately with cloths or mops saturated with a detergent solution prior to wet cleaning.

- D. The worker decontamination enclosure system shall be wet cleaned/HEPA vacuumed, as appropriate, after each shift change and meal break.
- E. Excessive water accumulation or flooding in the work area shall require work to stop until the water is collected and disposed of properly.
- F. Spillage of asbestos-containing waste material in an elevator shaft shall require:
  - 1. immediate evacuation, shut down and isolation of all elevators in the affected elevator bank, and
  - 2. containerization of all spilled visible accumulations of asbestos-containing waste material from within the elevator car and shaft, and
  - 3. HEPA vacuuming/wet cleaning of the contaminated surfaces in the elevator car and shaft in respective cycles until clearance air levels are achieved, and
  - 4. one air sample to be taken at each terminus of the shaft to be analyzed by PCM on a continuing basis until clearance air levels are achieved.
- G. Following careful double bagging of all removed asbestos material by the Contractor, he shall label bags as required by Section Four.
- H. Bags shall be wiped with clean damp cloths and placed in fiber containers prior to transportation to approved disposal site.
- I. Plastic barriers, as specified in Section Four, shall be carefully removed, folded inward and bagged for disposal. Barriers are not to be removed until work of all trades is completed.
- J. Hard surfaced flooring such as concrete, terrazzo, V.A.T. and ceramic tile, shall be wet mopped, allowed to dry, and damped mopped a second time with clean mop heads.
- K. Walls, furniture and equipment (which remained in work area during work operations) , Windows and other surfaces shall be thoroughly cleaned with damp cloths. A Second cleaning is also required.
- L. Carpeting shall be cleaned with a H.E.P.A. type vacuum cleaner. CONVENTIONAL VACUUMS WILL NOT BE PERMITTED. See Paragraph 6.04 B.
- M. All surfaces are to be left visually clean.
- N. All mops heads and cleaning cloths are to be discarded in the same manner as asbestos waste.

5.07 Final Cleaning:

- A. Definition: Additional clean-up procedures shall be performed in the order set forth below prior to commencement of clearance air monitoring.
  - a. After removal of visible accumulations of asbestos-containing waste material, a HEPA vacuuming shall be performed on all surfaces. To pick up excess water and saturated debris, a wet-dry shop vacuum, dedicated to asbestos abatement, may be used.
  - b. All surfaces in the work area shall be wet cleaned(first Cleaning)





## 02000 - Site Work

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- c. The cleaned layer of the surfaces barriers shall be removed from walls and floors. The isolation barriers shall remain in place throughout cleanup. Decontamination enclosure systems shall remain in place and be utilized.
  - d. After the first cleaning, the work area shall be vacated for 12 hours to allow fibers to settle. Then, all objects and surfaces in the work area shall be HEPA-vacuumed and wet cleaned a second time. The remaining plastic surface barriers shall be removed, while the isolation barriers shall remain in position.
  - e. After the second cleaning, the work area shall be vacated for 4 hours before wet cleaning and/or HEPA vacuuming all surfaces in the work area for a third cleaning.
  - f. As a prerequisite to commencement of clearance air monitoring, a thorough visual inspection shall verify the absence of asbestos-containing waste material (e.g. dust).
  - g. All containerized waste shall be removed from the work area through the decontamination enclosures and the holding area.
  - h. All tools and equipment shall be removed from the work area and decontaminated in the waste decontamination enclosure system.
  - h. Should air tests following final clean-up indicate a fiber count greater than 0.01 fibers per cubic cm, or 70 s/mm the Contractor shall re-clean work areas until additional air tests indicate a fiber count of 0.01 f/cc or less, or 70 s/mm or less.
- B. General: Prior to completion of the work, remove from the job site all tools, surplus materials, equipment, scrap, debris, and waste. Conduct final progress cleaning as described in Paragraph 5.06.
- C. Interior: Visually inspect all interior surfaces and remove all traces of soil, waste material, smudges, and other foreign matter. Remove all traces of splashed materials from adjacent surfaces. Remove all paint droppings, spots, stains, and dirt from finished surfaces. Use only the specified cleaning materials and equipment.
- D. Glass: Clean all glass inside of work areas.
- E. Polished Surfaces: To all surfaces requiring the routine application of buffed polish, apply the polish recommended by the manufacturer of the material being polished.
- F. Timing: Schedule final cleaning as approved by the Contracting Officer to enable the Contracting Officer to accept a completely clean project.

SECTIONS 6, 7, 8, 9, 10 and 11 of the Asbestos Task Force Standard Specifications shall become part of this contract when such items of work are included in proceed order.

### 12.01 DESCRIPTION:

- A. Work Included: The Contractor shall furnish all labor, materials, services, and equipment necessary for the complete removal of asbestos containing pipe and boiler insulation materials, and the proper disposal of same. All operations shall be in accordance with guidelines or regulations of the responsible agencies, DEP, EPA, OSHA and as specified herein and in Section Three.



Note: Removal and replacement not required where repair and patching is indicated.

B. Notes:

1. Pipe Insulation in some of the above listed areas may have already been removed.
2. Quantities listed are approximate, and bidders should visit site to ascertain exact quantities required.
3. Requests for additional payment, due to the fact that the actual installed and/or repaired footage is greater than that listed, will not be allowed, unless new areas are added by revisions.
4. Maximum of two boilers may be worked on at any one time. Set schedule with the City's Engineer at project location.

C. Related Work Specified Elsewhere:

- |  |                  |
|--|------------------|
| 1. Applicable Standards                      | Section Three    |
| 2. Temporary Facilities and Controls         | Section Four     |
| 3. Cleaning                                  | Section Five     |
| 4. Replacement of Pipe and Boiler Insulation | Section Thirteen |

12.02 Quality Assurance:

A. Worker Identification:

1. All workers must have their individual Certification displayed at the work site, or they will not be permitted to work on this project.

B. Posting of Regulations:

1. The Contractor will have at all times in his possession at his office (one copy) and in view at the job site (one copy), OSHA regulation 1926.58 Asbestos, and Environmental Protection Agency, 40 CFR, Part 61, sub-part B: National Emission standard for asbestos, asbestos stripping work practices, and disposal of asbestos waste.
2. The Contractor, when requested, shall furnish proof that his employees have had instruction on the dangers of asbestos exposure, on respirator use, decontamination, and OSHA regulations.

12.03 Materials: see paragraph 4.02.

12.04 Workers Dress and Equipment for Asbestos Removal:

See Paragraph 4.04

Caution Signs:

- A. Contractor shall install signs at all entrances to work areas as required by Section Five.
- B. All containers for debris shall be labeled prior to being removed from work areas. Labels shall be as required by Section Four.

12.05 Inspection: Examine the areas and conditions under which the work of this Section will be performed.

12.06 Preparation:



## 02000 - Site Work

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### A. Furniture and Equipment:

1. Moveable furniture and equipment shall be removed from areas of work by the Contractor and re-installed at completion of clean-up.
  2. Heating and Ventilating system servicing the areas of work must be shut down prior to starting any work.
  3. Notify Custodian prior to starting any work in order that he may arrange to have the H and V system shut down.
- B. Isolation: Isolation of the work areas, as required by Section Four, is necessary to prevent contamination and fiber dispersal to other areas of the building during work and clean-up operations.

### 12.07 Procedure:

#### A. Decontamination: The following procedures shall be followed the conduct of abatement activities on large asbestos projects:

- a. Worker decontamination enclosure systems shall be located outside the work area and attached to all locations where workers will enter or exit the work area is preferred. These systems may consist of existing rooms outside of the work area, that offer direct access to the work area and general egress from the work place.
- b. The worker decontamination enclosure system shall consist of a clean room, a shower room, and an equipment room, in series, separated from each other and from the work area by airlock and from the non-work place by a curtained door.
- c. Worker decontamination enclosure system shall be fully lined utilizing two layers of 6-mil opaque plastic sheeting at a minimum, or the equivalent.
- d. When the decontamination enclosure system is constructed outdoors or in areas with public access it shall be fully framed and plywood sheathed or equivalent to prevent unauthorized entry. When located outdoors, it shall be waterproof and windproof.
- e. Prefabricated or trailer decontamination units:
  1. shall at a minimum, have functionality and security equivalent to constructed decontamination enclosure facilities, and
  2. shall be completely decontaminated prior to removal from the work site.
- f. The clean room:



1. shall be sized adequately to accommodate the work crew, and
  2. shall contain secure crew lockers of shelves, and clean sealable plastic bags for storage of street clothes, and
  3. shall contain a sufficient quantity of branches, and
  4. shall contain shelves or appropriate facilities for storage of respirators, and
  5. shall contain disposable clothing, replacement filters for respirators, towels and other necessary personal protective equipment, and
  6. shall not be used for storage of tools, equipment or materials other than personal protective equipment, nor used as office space and
  7. shall be equipped with a lockable, shuttered door which opens on make-up air inflow and seals on air flow cessation for interior and exterior exits. The door shall permit entrance to the clean room and secure the work place during off-shift hours.
- g. The shower room:
1. Shall contain a minimum of one shower per 8 workers calculated on the basis of the largest shift, and
  2. shall have shower heads supplied with hot and cold water adjustable at the tap, and
  3. shall be constructed to ensure against water leakage, and
  4. shall contain liquid bath soap, shampoo and clean, dry towels in sufficient quantity for each worker for each showering.
- h. Shower water shall be drained, collected and filtered through a system with at least 5.0 micron particle size collection capability. A system containing a series of several filters with progressively smaller pore sizes shall be used to avoid rapid clogging of the filtration system by large particles.
1. Filtered wastewater shall be discharged either to a sewer or drummed and then properly disposed.
  2. Used filters shall be disposed of as asbestos-containing waste material.
- i. The Equipment Room:
1. shall be used for storage of equipment and tools used on the job that been cleaned previously in the work area, and
  2. may contain a limited supply of replacement filters (in sealed containers until used) for HEPA vacuums and pressure ventilation equipment, extra tools, containers of surfactant and other materials and equipment that may be required during the abatement activity, and
  3. shall contain labeled 6-mil plastic bags for connection of disposable clothing, and
  4. shall be used to store contaminated footwear (e.g. rubber boots and other reusable footwear) and contaminated clothing for reuse for the duration of the abatement activity or until disposed.
- B. Waste Decontamination Enclosure System:
- The following procedures shall be followed for removal of asbestos containing waste material and equipment during the conduct of abatement activities on large asbestos projects.:
- a. A waste decontamination enclosure system shall consist of two totally enclosed chambers and shall also comply with the following requirements:



## 02000 - Site Work

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1. The washroom shall be constructed with an airlock doorway to the work area and an airlock doorway to the holding area.
  2. The holding area shall be constructed with an airlock doorway to the washroom and a lockable door to the outside.
  3. Rinse water shall be drained, collected and filtered through a system with at least a 5.0 micron particle size collection capability system containing a series of several filters with progressively smaller pore sizes shall be used to avoid rapid clogging of the filtration system by large particles.
- b. Filtered wastewater shall be discharged either to a sewer or drummed and then properly disposed, and
- c. Used filters shall be disposed of as asbestos-containing waste material.

Where there is only one means of egress from the work area:

1. The holding area of the waste decontamination enclosure system may branch off from the equipment/decontamination room. Thus the equipment room alternates as a waste room. Thus the equipment room alternates as a waste washroom. In this case the waste washroom shall be equipped with a drain, installed to collect water and deliver it to the shower drain where it is filtered, or
  2. where total asbestos-containing material disturbed in the asbestos project is less than 1000 linear feet or 1000 square feet, the shower room may be used as a waste washroom, and
- d. The clean room may not be used for waste storage but is used for waste transfer to carts, which are stored outside the clean room in a designated holding area.
- e. The holding area of the waste decontamination enclosure system may branch off from the shower room of the worker decontamination enclosure system.
1. The enclosure system exit shall consist of a lockable horizontally shuttered door which opens on make-up air inflow and seals on air flow cessation. Enclosure systems which exit directly outdoors may substitute a lockable fence to prevent unauthorized entry.
  2. Safe and adequate heat and light shall be provided.
  3. A designated holding area at the work site shall:
  4. Be secured and maintained as a holding area contiguous with a waste decontamination enclosure system as specified herein, and
    - a. be appropriately sized for waste generation, and
    - b. conform to applicable Corpus Christi Army Depot Department of Sanitation regulations, and
    - c. be permitted to be located in an area outside the enclosure system when circumstances necessitate this arrangement.

C. Method of Removal:

ACM Disturbance, Handling and Removal Procedures.



The following procedures shall be followed during the conduct of abatement activities on large asbestos projects:

- a. Abatement of asbestos-containing materials shall be by the methods. Dry removal activities of asbestos-containing materials is prohibited.
  - b. When amended water is used, the ACM shall be sprayed with sufficient frequency and quantity for enhanced penetration to occur. Sufficient time shall be allowed for penetration to occur prior to removal action or other disturbance taking place. Accumulation of standing or free water is prohibited. Fluffy friable materials shall be saturated. Non-hygroscopic materials, such as tremolite or or amolite, shall be thoroughly wetted on all surfaces while work is being conducted.
  - c. When used, removal encapsulants that minimize fiber generation and enhance penetration, shall be applied per manufacturer's specifications and in accordance with Federal guidelines (see Section 8232). Asbestos-containing materials shall be removed expeditiously.
  - d. ACM on detachment from the substrate is to be bagged directly or dropped onto a flexible catch basin and promptly bagged. Excess air in the bag shall be minimized and the bag shall be sealed. Non-hygroscopic materials shall not be dropped from a height greater than 10 feet. Above 10 feet in height dust free enclosed inclined chutes prohibited. Maximum inclination from horizontal shall be 60 degrees.
  - e. Large components removed intact that cannot be containerized shall be maintained wet, wrapped(minimizing excess air) in at least one layer of 6-mil polyethylene sheeting, and secured by sealing with tape.
  - f. After completion of all stripping work, surfaces from which asbestos-containing materials have been removed shall be cleaned (e.g. wet-brushed and/or wet-cleaned) to remove all visible residue.
  - g. After the work area has been rendered free of visible residues, a thin coat of an encapsulating agent shall be applied to all surfaces in the work area from which ACM was removed, to seal in nonvisible residue.
  - h. Do not allow fallen material to litter floor, pick up and bag often.
  - i. Removed material to be placed in double 6 mil. (.006") polyethylene bags tied securely, and disposed of as described in Section Six.
  - j. Air testing shall be conducted as described in Air Testing Specification.
  - k. Vacuum any remaining material from sub surfaces, i.e.: sirt lath and concrete. Vacuum shall be type specified in Section Five.
  - l. All polythylene, tape, clothing and cleaning materials shall be bagged and disposed of as specified in Section Five.
  - m. Clean all equipment, tools, etc., prior to removing them from work area.
- D. Disposal: Submit all landfill dump tickets and hazardous waste manifest with application for final payment. See Section Five for E.P.A.notification requirement, and hazardous waste permit.
- E. Glovebag Procedures: See Section 6.06 c for example of legend brackets [] and underlined.



## 02000 - Site Work

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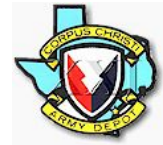
The following procedures shall be followed during the conduct of abatement [on large asbestos projects] activities:

- a. Movable glovebag procedures on pipe lagging shall be done using commercially available glovebags of 10-mil clear PVC or polyethylene, appropriately sized for the project. Glovebags may be shifted down a pipe or duct but shall not be moved from the initial pipe to another pipe, or reinstalled on the initial pipe once removed. Movable glovebag procedures applied to removal of greater than 1000 linear feet of pipe lagging shall require [establishment of isolation barriers, and engineering controls] local negative pressure ventilation units to be utilized.
- b. Stationary glovebag procedures on pipe lagging shall be done using commercially available glovebags of a minimum of 6-mil clear plastic, appropriately sized for the project. These glovebags shall not be shifted, moved, re-installed or re-used once used for ACM removal.
- c. The glovebag procedure shall be performed in accordance with the following:
  1. All necessary tools and materials shall be brought into the work area before the glovebag procedure begins.
  2. Air Monitoring shall be conducted in accordance with Sections 8170-8177.
  3. Glovebag procedures shall be conducted by [a minimum of two] workers specifically trained in glovebag procedures and equipped with [full] appropriate personal protective equipment.
  4. The pipe insulation diameter worked shall not exceed one half the bag working length above the attached gloves.
  5. The ACM within the secured glovebag shall be wetted with amended water prior to stripping.
  6. The bag shall be attached over duct tape which has been placed securely around the insulation, forming a smooth seal. A gasket material may be inserted between the tape and attached to the insulation in a manner to prevent air transfer.
  7. The integrity of the glovebag seal shall be smoke tested. If the worked on is damaged, or if the pipe insulation terminates or is joined or contains an elbow adjacent to the work section, the adjacent insulation shall be wrapped in 6-mil polyethylene sheeting and sealed airtight with duct tape.
  8. If the pipe insulation adjacent to the section which will be worked on is damaged, or if the pipe insulation terminates or is jointed or contains and elbow adjacent to the work section, the adjacent insulation shall be wrapped in 6-mil polyethylene sheeting and sealed airtight with duct tape.
  9. After the insulation has been removed, the pipe shall be sprayed with amended water and brush-scrubbed to remove all visible ACM. The pipe, the interior of the bag, the insulation and the tools shall be misted and time allowed for the mist to settle out before breaking the seal to shift or remove the glovebag.
  10. Any pipe insulation ends created by this procedure shall be:
    - a. sealed with encapsulant prior to bag removal, or



- b. thoroughly wetted before bag removal and sealed with wettable cloth and caps and spray glue or any combination of these materials immediately following bag removal or shifting.
  - 11. The movable glovebag shall be shifted in a manner to minimize air transfer from the bag and shall not be shifted more than 3 times/glovebag.
  - 12. The total pouch shall be separated from the bag prior to disposal by twisting it and the wall to which it is attached several times, and taping the twist to hold it in place, thus sealing the bag and the pouch which are severed at the midpoint of the twist. Alternatively, the tools can be pulled through with one or both glove inserts, thus turning the gloves inside out. The glove(s) is/are then twist sealed forming a new pouch, taped and severed mid-seal forming two separate bags.
  - 13. A HEPA vacuum shall be used for evacuation of the glovebag in preparation for removal of the bag from the pipe or duct, for clean-up in the event of a spill, and for post project clean-up.
  - 14. With the glovebag collapsed and the ACM in the bottom of the bag, the bag shall be twisted several times and taped to seal that section during bag removal.
  - 15. A 6-mil plastic bag shall be slipped around the glovebag while it is still attached to the pipe. The bag shall be detached from the pipe by removing the taper or cutting the top with a blunt scissors.
  - 16. The asbestos-containing waste, the clean-up materials, and protective clothing shall be wetted sufficiently, double-bagged minimizing air content, sealed separately, and disposed of in conformance with these regulations.
- F. Tent Procedures shall be conducted as follows:
- a. Tent procedures shall be limited to the removal at any one time of less than 260 linear feet or 160 square feet of ACM and shall not result in disturbance of ACM during tent erection.
  - b. Tent procedures shall be accomplished in a constructed or commercially available plastic tent, plasticizing and sealing all surfaces not being abated within the tent periphery forming an enclosure. The tent shall be of 6-mil PVC at a minimum, with seams heat-sealed, or double-folded, stapled and taped air tight and then taped flush with the adjacent tent wall. This is a single use barrier that shall not be reused once dismantled or collapsed.
  - c. Asbestos handlers involved in the tent procedure shall wear two (2) disposable suits, including gloves, hood and footwear, and appropriate respiratory equipment. All street clothes shall be removed and stored in a clean room within the work site. The double layer personal protective equipment shall be used for installation of the tent and throughout the procedure if a decontamination unit with a shower is not contiguous to the work area. If a decontamination unit (with a shower and clean room) is contiguous to the work area, only one layer of disposable personal protective equipment shall be required.
  - d. The tent shall be attached to the substrate to produce an airtight seal except for an appropriate section to allow for make up air into the tent.





## 02000 - Site Work

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- e. A HEPA vacuum or equivalent shall be used to continuously exhaust the enclosed area as specified under Section 8221, Engineering Controls, except that the negative air pressure in subdivision (c) shall be demonstrated by smoke testing. The hose shall be attached securely and airtight through the tent wall at the most remote location possible from the ACM to be disturbed. A minimum of two volume changes per hour is required.
- f. Removal of ACM shall be by wet methods.
- g. ACM removed shall be placed in a leak tight container without dropping it.
- h. Upon completion of abatement, and prior to tent collapse, the enclosed substrates shall:
  - 1. be wet cleaned using rags, mops or sponges; and
  - 2. be permitted sufficient time to dry, prior to HEPA vacuuming all substrates; and
  - 3. be lightly encapsulated to lockdown residual asbestos.
- i. Upon barrier disturbances, loss of engineering controls, or termination of tent usage, the tent and the enclosed substrates shall be treated according to subdivision (h).
- j. The bagged waste shall be wet cleaned or HEPA vacuumed and then transferred outside the tent, double bagged, and appropriately handled prior to disposal.
- k. The outer disposable suit shall be removed and remain in the tent upon exiting. Following tent disposal and work site cleanup the workers shall immediately proceed to a shower at the work site. The inner disposable suit and respirator shall be removed in the shower after appropriate wetting. The disposable clothing shall be disposed of as asbestos-containing waste material. The workers shall then fully and vigorously shower with supplied liquid bath soap, shampoo, and clean, dry towels.
- m. The tent shall be collapsed inward, enclosing the contaminated clothing. This contaminated material shall be disposed of in another plastic bag. The HEPA vacuum shall be decontaminated and sealed.

### 12.08 Cleaning:

- A. Procedure:
  - 1. Cleaning shall be carried out in accordance with the requirements of Section Five.
  - 2. Perform daily wet cleaning of any area outside the work areas which becomes visibly contaminated with airborne or tracked-in dust or other debris as a consequence of work performed that day.
- B. Final Cleaning: All areas used by workmen, both inside and outside of work area shall be left visually clean. See Section Six.
- C. Do not take down barriers or start a re-insulation until air test results are received and approved by the Asbestos Unit.

### 12.09 Pipe Removal:

When pipes are insulated with asbestos-containing materials, removal of the entire pipe may be easier, more protective, and more cost-effective than stripping the insulation from the pipe. When such a procedure is employed, the following requirements shall be met:



- a. Before such a pipe is cut, the asbestos-containing insulation must be wrapped with more than one layer of 6-mil plastic and securely sealed with duct tape or equivalent. This plastic covering shall prevent asbestos fibers from becoming airborne as a result of the vibration created by the saws used to cut the pipe.
- b. The pipe shall be cut at locations that are not insulated to avoid distributing the ACM. If a pipe is completely insulated with ACM, small sections shall be stripped using the glovebag procedure described in Section 8234 before the pipe is cut of the stripped sections.
- c. A power saw shall not be used for this procedure.

13.01 Description:

A. Work Included:

1. Materials, and labor necessary to furnish and install non-asbestos pipe and boiler insulation to all surfaces from which asbestos insulation was removed as part of the work of this contract, (include combustion chambers).
2. Replacement also required where pipe insulation listed in Section four was missing.
3. Painting of newly installed insulation, and boiler equipment.

Note: Do not commence re-insulation or remove barriers until final air test results are received and approved by Asbestos Unit.

B. Locations: See paragraphs 12.01 B for locations of work.

C. Related Work:

Applicable Standards	Section Three
Cleaning	Section Five
Removal of Asbestos-Containing Material	Section Twelve

13.02 Submittals:

- A. Samples: Submit samples of each type of material proposed for project, to the Asbestos Unit for approval, prior to installation.
- B. Manufacturer's Instructions: Furnish manufacturers printed material specifications and application instructions for material being submitted for approval.
- C. Certificates:
  1. Furnish manufacturer's certification that materials meet or exceed specification requirements.
  2. Furnish applicators certification that material has been applied in accordance with manufacturer's printed instructions.

13.03 Product Delivery, Storage and Handling:

- A. Deliver materials in original, unopened packages bearing name of manufacturer and product identification.
- B. Reject damaged packages found unsuitable for use and remove from job site.



## 02000 - Site Work

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- C. Store materials off ground, under cover, and away from damp surfaces.
- D. Keep materials dry at all times. All materials that have been exposed to water before use shall be discarded.
- E. Material is not to be used after its expiration date.

### 13.04 Job Conditions:

- A. Environmental Conditions:
  - 1. Do not apply insulation when temperature of substrate is below 40°F. (4.4C) and surrounding air temperature is below 40°F. (4.4C).
  - 2. Maintain temperature for 24 hours before and after application.

### 2.1 Approved Manufacturers:

Note: All materials furnished under this Section shall be Asbestos Free as specified herein or in Bureau of Design Heating and Ventilating Standard Specification (16th Edition).

- A. Pipe Insulation:
  - 1. Certain - Teed Corporation
  - 2. Johns - Manville Corporation
  - 3. Owens - Corning Fiberglass Corp.
  - 4. Armstrong Cork Company
- B. Properties:
  - 1. One piece, molded sectional fiberglass.
  - 2. Nominal four (4) pound density.
  - 3. Maximum thermal conductivity - 0.23 @ 75°F.
  - 4. Suitable for use on piping up to 370°F.
  - 5. One inch thick for steam and hot water pipe sizes up to and including 3 inches.
  - 6. Two inches thick for steam and hot water pipe sizes over 3 inches.
  - 7. One inch thick for refrigerant, cold and chilled water piping.
  - 8. All joints shall be firmly butted together.
- C. Adhesives:
  - 1. Benjamin Foster Company
  - 2. Epolux Manufacturing Corp.
  - 3. Insul-Coustic-Birma Proc. Corp.
- D. Boiler Insulation Materials:
  - 1. Calcium silicate Block - 1 1/2" thick.
  - 2. Galvanized Steel Wire - 16 gauge



- 3. Galvanized 2" Hexagonal Wire Mesh.
- E. Thermal Insulation for Valves, Fittings, Etc.
  - 1. Insulating Cement, #460 CEMENT
  - 2. Finishing Cement, #375 CEMENT by Johns - Manville, or an equal approved by the Contracting Officer.

Insulating cement shall be a mineral fiber cement with excellent adhesion on cold surfaces. Can be applied in heavy layers.

Finishing cement shall be a hydraulic-setting, insulating and finish-cement suitable for one-coat application. Harden in a few hours to a smooth crack free surface that can be painted with a water-base paint.
- 13.06 Painting Work:
  - A. Material: "Kem Gard", Latex fire retardant paint.
  - B. Manufacturer: Sherwin-Williams, or other U.L. listed approved equal.
  - C. Color: To match adjoining insulation or surfaces, unless otherwise directed.
- 13.07 Other Materials:
  - A. Aluminum Bands: One inch (1") wide.
  - B. Canvas: 6 ounce
  - C. Lagging Adhesive: American Adhesive Co. #6120 or approved equal.
- 13.08 Water: If approved cements require job-addition of water, use only clean and potable water for that purpose.
- 13.09 Insulation, adhesive materials and finishing jackets shall have a flame spread rating of 25 or less and a smoke developed rating no higher than 50.
- 13.10 Preparation:
  - A. Clean substrate of dirt, dust, grease, oil, loose material, frost, or other matter which would affect bond of thermal insulation.
  - B. Carefully examine substrate to insure that all asbestos-containing material has been removed.
  - C. Do not commence application of thermal insulation until substrate has been examined and approved by the Contracting Officer.
  - D. After removing the existing boiler insulation and prior to the installation of any new boiler insulation, the Contractor must notify the area office in order that they may inspect the stay bolts.
- 13.11 Application of Boiler Insulation:
  - A. Apply thermal insulation in strict accordance with manufacturers printed instructions and as specified herein.
  - B. Submit samples and literature for approval prior to starting application. See paragraph 13.03 herein.



## 02000 - Site Work

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- C. Insulate each boiler on all surfaces, including the front and rear smoke boxes, excluding manholes, handholes and the area of the boiler front marked with maker's name, pressure, I.D. marks, symbols, etc.
- D. Insulation shall consist of 1 1/2" thick "asbestos free" calcium silicate block, with vertical joints staggered.
- E. Blocks are to be held in place with 16 ga. galvanized steel wire, secured to holes in frames around handholes, manholes, doors, base, etc. (note: If frames are not in place, furnish and install same as Specifications for Heating and Ventilation work).
- F. Apply 2 inch galvanized, hexagonal wire mesh and a 1/2" thick coating of insulating and finishing cement troweled to a smooth hard finish.
- G. Furnish and install galvanized steel corner beads at all outside corners
- H. Access plates at back and bottom of rear smoke box shall not be insulated.

13.12 Smoke Breeching Insulation: Where smoke breeching and or boiler connections are specified to be repaired repairs shall be made as follows:

- A. Secure V-ribbed wire lath to all surfaces, the ribs providing a 1-inch air space between breeching and metal lath.
- B. Outside lath, install 1 1/2" thick asbestos free calcium silicate blocks, securely held in place with 16-gauge galvanized wire.
- C. Over this fasten 2 inch hexagonal mesh galvanized wire netting and 1/2" insulating and finishing cement, troweled to a smooth hard finish.
- D. Install galvanized steel corner beads at all outside corners where same is missing or removed.
- E. Do not insulate expansion joints, smoke indicators, end of damper housing on which bearings are mounted, test openings and clean out doors.
- F. Insulation adjoining these items specified in paragraph E, shall be neatly beveled around such equipment.

13.13 Patching: Patch all damaged and cracked areas of existing boiler breechings with a non-asbestos insulating and finishing cement to match existing adjoining surfaces.

13.14 Combustion Chamber Insulation:

- A. Combustion Chamber: For fire-box boilers, the underside of rear baffle plates, the inside of shell sheets forming rear combustion chambers, and the cast-iron liner of flue doors of all boilers shall be protected with a 2-inch thick layer of North American Refractories Co. No. 505 "Narco", mixed with "Narco Set Cement" or of Aurora Insulating Products Co. "Webers 48 Cement": finished with Aurora "Heat Resistant Putty", applied as directed by the manufacturers with No. 19 gauge 3/4-inch mesh wire screen with 1/2-inch spacing ribs and with standard 3/8 inch stove bolts set staggered on about 6-inch centers, extended through mesh and through cast-iron liner, through rear baffle plate and through metal of surface thus to be protected, or other approved equal materials. Wire mesh shall be secured with suitable tie-wires to angles provided on shell in rear combustion chamber.



- B. The cast iron liners of fire-doors of oil fired boilers shall also be protected with plastic refractory, wire mesh screen, bolts, etc., as specified above in Par. A. Before applying refractory to fire doors, the cone at observation port shall be provided with a layer of paper around same, as directed, to provide space for expansion when paper burns out.
- C. Expansion joints shall be provided in the plastic refractory linings of boiler doors by means of full length horizontal and vertical sawcuts through such linings. Fire door linings shall have one horizontal and one vertical cut, each running through the center line of the observation port cone. Flue door linings shall have three horizontal and two vertical cuts, equally spaced.

13.15 Installation:

- A. Pipe Insulation: Following the removal of damaged pipe insulation at locations listed in paragraph 12.01 B herein.
  - 1. Install new pipe insulation at areas where asbestos insulation was removed as part of the work of this contract, and at areas where missing insulation is listed.
  - 2. Cover all newly installed pipe insulation in finished spaces (occupied areas) with canvas. Canvas shall be adhered with two flood coats of lagging adhesive. The canvas shall overlap all seams a minimum of two inches. The use of wheat paste or similar adhesives is prohibited. Canvas shall not be secured to fittings, etc., until insulating cement on fittings is thoroughly dry.
  - 3. Securely band all other pipe insulation, installed as part of the work of this contract, with 1-inch wide aluminum bands. Bands shall be installed on each end and at intervals of not more than 18 inches on centers.
  - 4. Apply stickers as specified in paragraph 13.17 herein.
- B. Valves, Fittings and Flanges:
  - 1. Apply insulating cement over valve bodies, fittings and flanges, to a thickness equal to the adjoining insulation and finish with one coat of finishing cement.
  - 2. On small pipes and fittings only the finishing cement shall be applied.
  - 3. Finish to a smooth hard finish.
  - 4. Patch damaged fittings in areas of work.

13.16 Painting:

- A. All new pipe insulation installed, in occupied areas, as part of the work of this contract, shall be painted with two coats of material listed in paragraph 13.06 herein.
- B. New boiler, tank or breeching insulation and all fixtures and fittings on them are to be painted with one finished coat of aluminum paint.

13.17 Non-Asbestos Stickers:

- A. Apply non-asbestos stickers to all newly installed, non-asbestos insulation.
- B. Stickers may be obtained from the asbestos Task Force.
- C. Stickers to be applied as follows:



## 02000 - Site Work

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1. One (1) each on front and rear of boilers.
2. Two (2) each on sides of boilers.
3. Every twenty feet (20') on complete runs of new pipe insulation.
4. On new sections of pipe insulation less than twenty feet (20') long. Ends of run to be marked with blue cloth tape.

END OF SECTION 02113



## SECTION 02115

### UNDERGROUND STORAGE TANK INSTALLATION

#### 1.0 General

- a. It is the intent of this specification to ensure that the work, as completed, shall meet or exceed all applicable codes, ordinances, rules and regulations of every authority having jurisdiction in the area.
- b. The installation shall include all necessary equipment, controls, valves and fittings, excavation, backfill as described or called for on the plans. In some cases, the Contractor shall prepare the plans. In any case, the Contractor shall obtain all permits at his expense.
- c. The Contractor shall install equipment in accordance with manufacturer's recommendations. Where drawings and specification conflict with manufacturer's recommendations, it shall be the Contractor's responsibility to bring this to the attention of the Project Manager or the Engineer before installation.
- d. The overall intent shall be that the Contractor shall provide everything required to make a complete and operational job in every respect.

#### 1.1 CODES AND STANDARDS

- a. Reference is to the latest edition of the code or standard unless otherwise noted. Comply with the latest EPA requirements.
- b. The codes and standards referred to are the minimum standards. Where the requirements of these specifications and the accompanying drawings exceed those of the codes and standards, the drawings and specifications shall supersede.
- c. The installation shall conform to provisions of the NFPA requirement with latest amendments.
- d. The entire installation including all equipment shall conform to The Occupational and Safety Health Act of 1970, and all EPA regulations.

#### 1.2 VISIT TO SITE

Contractor's are advised to visit the site and carefully examine the existing conditions before submitting proposals, as no allowance will be made for lack of knowledge of existing conditions where such conditions may reasonably be determined by observation.

#### 1.3 PERMITS

- a. Obtain all permits required for the installation of this work and pay all fees in connection therewith. Permits and fees involved in removal of any item from the site shall be included.
- b. Provide copies of inspection and testing certificates from all agencies and authorities having jurisdiction.





## 02000 - Site Work

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### 1.4 LAYOUT BASIS

- a. The layout, which must be stamped by an Engineer registered in Texas, is based upon the use of particular items of equipment, identified by manufacturer's make and model number. Dimensions, arrangements, efficiency and service connections required for these particular items have been considered in making the layout. Contractor shall submit any deviations proposed with his bid.
- b. The Contractor may use the equipment of any manufacturer listed as approved for substitution provided they have the proper connections, capacities, efficiency and dimensions. Variances from the requirements stated herein shall be sustainable reasons for disapproval of the submitted equipment. All cost arising from variances in substituted items shall be paid for by the Contractor.
- c. Equivalent products by other manufacturers must be submitted to the Project Manager for prior approval at least ten (10) days prior to bid date.

### 1.5 SHOP DRAWINGS

- a. All submittals shall bear a stamp or notation indicating that the Contractor has reviewed the submittals for compliance with drawings, governing authorities and specifications.
- b. All submittals shall bear sufficient notations to clearly indicate the specific make, model number, accessories, capacities, options, and specification paragraph numbers.
- c. All submittals shall indicate complete compliance with all performance and specification requirements as herein specified and/or shown on the drawings or shall specifically list any exceptions. Exceptions shall be subject to approval by the Project Manager.
- d. The review (by the Project Manager) of equipment does not relieve the Contractor of the responsibility for compliance with the contract documents or authorities as specified.
- e. Contractor shall coordinate electrical characteristics of equipment with electrical specifications and the available power characteristics.
- f. Materials requiring shop drawing submittals shall not be installed prior to shop drawings being reviewed by the Project Manager. The Contractor agrees that failure to conform to the above may result in removal of all installed materials that have been disapproved from the project. Installation of specified equipment will be mandatory. Removal of disapproved equipment shall be at the sole expense of the Contractor.
- g. Submit the following for review via shop drawings (to be approved or disapproved):
  1. Xerxes or approved equal, double wall (do not unload manually). Size and capacity.
  2. Bury depth.
  3. Bed and backfill (not over 7'-0" traffic and no traffic).
  4. Double walls when continuous vacuum pump and monitor are used require a maximum burial depth of three (3) feet from tank top to grade.
  5. When not subjected to traffic loads, use 24" backfill. 12" plus 4" re-concrete on top.



6. When subjected to traffic loads, use 36" backfill or 18" minimum backfill plus 6" re-concrete.
7. If tank is 12'-0" in diameter (actually, 7'--11" is manufactured for large gallonage) then, no traffic shall be provided with 42" minimum cover, or 38" backfill plus 4" re-concrete. With traffic, use 38" backfill plus 6" of asphalt or 6" of re-bar reinforced concrete.
8. Monitoring fittings, fiberglass reservoir, vapor sensor 4" tank fittings, tank fill tube insert, venting, stage II vapor recovery system, manway and manway extensions, manway risers, site monitoring wells, barricades, installation check list, hydrostatic tank monitoring.
9. Job site safety precautions.
10. Reservoir fiberglass sensor.
11. Reservoir leak detection.
12. Electronic control panels, sensor circuit, transmission contact switch power source circuit, alarm bell, alarm bell silence button, control panel false alarms, etc.
13. Piping sump bottom, usually 28 3/8" x 30".
14. Flex connectors to piping.
15. Unions, nipples, manway cover, FRP fitting, opening for stage II vapor recovery line if required.
16. 3" pipe sump fitting.
17. When using piping sump sensor equal to Owens Corning fiberglass model PSS, submit system including electrical power supply and signal wiring.
18. Control panel equal to Owens Corning fiberglass model SB-0011B (single circuit) or SB-0014B (4 circuit) as applicable.
19. Fiberglass pipe and fittings equal to "Ameron" type Dualoy 3000/L pressure rated and with chemically resistant epoxy resin for the service intended. The Dualoy 3000/L shall be a secondary containment system. No other product piping will be acceptable.

#### 1.6 GUARANTEE

This Contractor shall guarantee that if any materials or workmanship covered by these specifications proves defective within one (1) year, such defects shall be corrected by the Contractor at once without charge.

#### 2.0 PRODUCTS:

##### 2.1 DOUBLE-WALL FIBERGLASS UNDERGROUND STORAGE TANKS

- a. The Contractor shall provide and install the "fiberglass" underground storage tanks of the specified volume and diameter.
- b. The tank shall be of fiberglass. Tank laminates shall be constructed of 100% resin and fiberglass reinforcements without sand fillers. Ribs are to be integrally cast into tank body. Tanks shall bear the listing mark of Underwriter's Laboratories, Inc. Tank shall have an annular space between the primary and secondary shell walls to allow for free flow and containment of all leaked product from primary tank. This space shall be filled at the factory with a brine solution for



## 02000 - Site Work

hydrostatic monitoring. Tanks shall be as manufactured by Xerxes Corporation, Minneapolis, MN or approved equal as judged by Engineer.

- c. The tank shall comply with the following governing standards:
  - 1. ASTM Standard Document No. 4021-81
  - 2. Underwriter's Laboratories, Inc. (UAL) File #MH-9061 (N) for underground storage of flammable liquids. A.U.L. certification plate shall be attached to each tank.
  - 3. Military Specification No. MIL-T-52777(A)
  - 4. Factory Mutual Systems approval J.I. IG4AO.AF
  - 5. National Sanitation Foundation, Standard 14
  - 6. National Fire Protection Association (NFPA-30), (NFPA-30A) Flammable and Combustible Liquid Code and (NFPA-31) Standard for Installation of Oil Burning Equipment.
- d. The tank shall be capable of the following loading conditions:
  - 1. Internal load: Tank shall withstand 5 psi air pressure test with 5 to 1 safety factor. Contractor shall test prior to installation as this is to test for leakage. Maximum test pressure is 5 psi.
  - 2. Vacuum Test: Every tank shall be tested to 11.5 inches (primary tank) and 9.5 inches (secondary tank) mercury vacuum by the tank manufacturer to assure structural integrity.
  - 3. Surface Loads: Tank shall withstand surface H-20 axle load when properly installed according to current manufacturer's installation instruction (32,000 lbs.).
  - 4. External hydrostatic pressure: Tank shall withstand 7' of overburden with the hole fully flooded with 7:1 safety factor against buckling.
- e. Provide glass fiber-reinforced plastic straps for the tank shown. Provide number and location of straps as specified by the manufacturer. Each strap shall be capable of withstanding the buoyancy load of 25,000 lbs. for 8' tank diameter. Straps shall be standard as supplied by the tank manufacturer. A concrete pad or concrete deadman must be used with anchor straps as recommended by tank manufacturer.
- f. The Contractor shall provide Fiberglass piping sump with fittings as shown on the drawings. The piping sump shall be manufactured by Xerxes Corporation or approved equal and supplied with tanks.

The piping sump shall be installed so that it is suitable for monitoring the Double-wall piping system and containment of it's product. Piping sump shall be located on tanks 22" minimum manway.
- g. All tank fittings shall be standard (proofed tight) as supplied by the tank manufacturer. The tank shall have an opening for one each of the following:
  - 1. Fill/Manual Gauging
  - 2. Vent/Overfill/Stage One Vapor Recovery
  - 3. Pump (pressure system) or supply and return (suction system)
  - 4. In tank gauging automatic inventory control



5. Others as shown or required by the operating agency
  - h. The tank shall have a factory filled brine interstitial and reservoir for continuous monitoring of both inner and outer walls.
  - i. Tank to be installed per manufacturer installation instructions which will be inspected as it progresses by the F.C.P.B. Department.
- 2.2 SPILL PROTECTION

Universal model 70CD or approved equal spill containment shall be used as containment basin for spills during filling. A manual valve, if so required, is used to return any spilled product back to tank.
- 2.3 OVERFILL PREVENTION

Universal model 37 or approved equal float valve is to be used for overfill prevention. The automatic shut off device must stop the flow of product being delivered when tank is 90% full. Access must be provided.
- 2.4 STAGE ONE VAPOR RECOVERY

Stage one vapor recovery is incorporated into the access assembly of the overfill prevention access way. See drawing for details. (Less than 10,000 gales per month through flow)
- 2.5 STAGE TWO VAPOR RECOVERY

Piping for stage two vapor recovery will be installed for future use. Required for gasoline motor fuel only. (More than 10,000 gales per month through flow)
- 2.6 TANK TRIM

Surface manholes shall have all cast iron rim and minimum 10" galvanized steel skirt. Tank trim shall have Universal Valve.
- 2.7 SUBMERSIBLE TURBINE PUMP SPECIFICATIONS
  - a. General Pump Specifications

The pump shall be designed to pump gasoline, diesel, kerosene and jet fuel. The entire pumping assembly shall have UL listing and shall meet all requirements of UL Standard UL79. The pump discharge head and manifold assembly shall be manufactured from ASTM A48 Class 30 grey iron. The pump shall be available in 1/3, 3/4, and 1-1/2 hp sizes and shall be manufactured to the proper length as determined by the tank diameter, type of tank, and bury depth. The pump motor shall have a thermal over current overload protector with automatic reset. The pump motor assembly shall be clearly marked with pertinent information including Model, Horsepower, Voltage, Phase, and Manufacturer. The pump motor shall be a permanent split phase capacitor type, and shall incorporate a 15 mfd capacitor. The pumping unit shall not incorporate any flexible diaphragms and all sealing shall be accomplished with "o" ring or UL recognized fiber gaskets. The pump shall have a removable intake screen with openings no greater than 3/32 inch. The pump shall be manufactured by FE Petro, Inc., McFarland, WI. or approved equal as judged by the Engineer.
  - b. Installation and Maintenance Specifications



## 02000 - Site Work

The pump shall have a two-wire field connection and an easy access ground wire terminal, and shall incorporate a wire seal plug which will accommodate three wires. The pump shall incorporate a port for line pressure testing that shall be sealed with a 1/4 NPT pipe plug. The pump unit shall have a fully extractable head in order to permit removal of the pump motor assembly without disturbing the discharge piping or the electrical wiring. The product in the pipelines shall be held in place by a line check valve that shall have a minimum sealing of 170 lbs when the pump is not running. The line check valve shall be independent of the removable head and shall be easily accessible. The removal of the extractable portion of the pump shall not disturb product in the pipelines downstream of the check valve. During the removal of the extractable portion of the pump, product contained in the discharge manifold of the pump shall drain automatically into the storage tank. The pump motor shall be interchangeable by horsepower with different manufacturers' product.

### c. Operation Specifications

The pump shall have an air/vapor elimination system that returns air or vapors to the underground storage tank through a tube discharging near the top of the pump motor assembly. The pump unit shall contain a built-in expansion relief valve that relieves pressure above pumping pressure but below 50 psi. The pump motor shall utilize the product being pumped for lubrication of the motor bearings and for cooling the stator, and this fluid shall discharge into the underground storage tank at the top of the motor. The pump shall have siphon capability built into the pump as standard.

### PIPING SYSTEM

- a. All piping fittings and adhesives shall be UL listed made of fiberglass double wall. Pipe shall be in compliance with ASTM D-2996 and classified by designation code RTRP-11AF-3111. Pipe shall be filament wind of continuous glass filament. Pipe must have a minimum bend radius of 50 feet on 2" primary (80 feet on 3" secondary) to allow settling of tank. Pipe shall have maximum tensile loads of 1160 lbs, compressive loads 2210 lbs at 75 degrees Fahrenheit on 2" primary. 3" pipe shall have tensile load of 2020 lbs at 75 degrees and compressive loads of 3850 lbs. Pipe to be factory proof tested at 1000 psig-2", 700 psig-3". Pipe shall be Smith Fiberglass Red thread II, or approved equal as judged by Engineer.
- b. Vent piping shall not have secondary containment. Vent shall not be sloped less than 1/4" per foot downward to tank.
- c. Product piping shall have secondary containment. Product piping shall not be sloped less than 1/8" per foot downward toward tank.
- d. All piping must slope back toward tank.
- e. All piping must be installed as per manufacturer installation instructions. Corpus Christi Army Depot shall monitor each installation daily.

### 2.8 LEAK DETECTION

- a. Tank shall have a Pullulert FD241RRA or approved equal float probe mounted on the brine filled hydrostatic reservoir. The system shall monitor both the inner and outer walls of the tank.

Alarm Conditions:



1. Hydrocarbons in hydrostatic reservoir
2. A loss of fluid in reservoir
- b. Piping shall have a Pollulert FD241RRA or approved equal float probe mounted in the piping sump. System shall monitor the piping sump compartment that has to be designed to catch any leaked product from the primary piping system. This probe shall distinguish the difference between water and hydrocarbons and alarm on any one or both conditions.
- c. Remote monitoring piping sumps shall be installed only if piping can not be sloped toward tank. The Contractor will use as many remote monitoring piping sumps as needed to assure that all sections of piping are monitored. All monitoring sumps shall have a Pollulert FD241RRA or approved equal probe for leak detection.
- d. Control panel shall have probe status for wet, dry, or hydrocarbon. Alarm conditions are to be selectable. Control panel must have installed relay or provision for installing relays for remote alarms. Control panel will have both visual and audible alarm. System shall have a two year warranty from date of manufacture. Ground water probes shall be adjustable 1/8" to 2" for product detection. Probes are to be wired by a single cable run. Systems must be UL listed for Class 1, Division 1, Group D locations and meet all existing EPA regulations. Leak detection shall be Pollulert systems or approved equal.
- e. Submersible pump shall have a mechanical in line leak detector with a free floating check valve. Leak detector shall be vaporless LD2000 or approved equal.

## 2.9 IN TANK GAUGING SYSTEM

Gauging system shall provide inventory management designed to continuously monitor underground storage tanks. System must provide information on inventory, delivery of fuel, and product through put. System must measure fuel levels, water level and fuel temperature. This is to insure proper compensated level readings. System shall have five temperature sensors, two floats, one for product level, one for water interface. System shall have a 48 character LCD display and internal thermal printer. System shall utilize a magnetostrictive probe and have visual, audible alarm with automatic printout. The system shall be designed to have 16 input on/off devices, RS232 port full duplex with adjustable baud rate. Tank gauging system shall be Pollulert system or approved equal.

## 2.10 TEST FOR PIPE

- a. Test of the piping system shall be made per manufacturer's recommendations .
- b. Furnish the Engineer with a certificate stating that all piping has been tested as specified and has been shown to be tight.
- c. The piping systems may be tested in sections if necessary, but a final test may be required of the entire piping system at the completion of the system. The final test shall be made while pipe is exposed to view where possible.
- d. Both primary and secondary pipe must be tested.

## 2.11 TEST FOR TANK

- a. Pre-installation: All Xerxes or approved equal tanks shall be tested prior to shipment, but it is required that all tanks be tested by the Contractor prior to installation. After installation and



## 02000 - Site Work

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before final backfilling to grade, the tank must be retested to assure that no damage occurred during installation.

- b. Hose/Valve Assembly: In order to test the tank, the hose/valve assembly must be connected from the reservoir to a service fitting. The hose/valve assembly will already be connected from the reservoir to a service fitting when the tank is shipped. If the hose/valve assembly is not connected when the tank is delivered, contact the Customer Service Representative at the Xerxes or other plant nearest you, before attempting to test the tank.
- c. Primary (Internal) Tank Test: Prior to installation, check to see that all service and monitor fittings are plugged and tightened, except the service fitting with a temporary plastic plug. Close the valve on the hose/valve assembly. Remove the temporary plastic plug and connect the pressure source to the service fitting. Pressure test the primary (internal) tank to 5 psig for 60 minutes.
- d. Secondary (External) Tank Test:
  - 1. CAUTION: Never pressurize the secondary tank or (annular space) without connecting it to the primary tank. The secondary tank and primary tank will be properly connected if the hose/valve assembly is in place as shipped. Failure to have the secondary tank and primary tank properly connected could potentially result in tank failure and personal injury, and will void all warranties.
  - 2. While the primary tank is still under pressure, open the valve on the hose/valve assembly until the pressure stabilizes. Once the pressure has stabilized, either add or subtract air pressure to stabilize the pressure at 5 psig. Observe the tank for any liquid on the exterior surface and check the gauge at the pressure source for any drop in pressure.
  - 3. After completing the test, relieve the pressure at the source.

### 2.12 PRODUCT DISPENSER

A fiberglass containment box shall be installed with each product dispenser. Containment box shall be as manufactured by Petro Fiberglass or approved equal. Double wall pipe shall terminate inside containment box. A flex connector as manufactured by Dana Everflex or approved equal shall be used to connect product pipe to the shear valve within the containment box. The shear valve shall be air tested at the factory and shall not lose its seal when its top is removed for service. Shear valve shall be Universal model 521 or approved equal. Each product dispensing hose shall be equipped with a re-connectable breakaway featuring a pressure balancing chamber to prevent nuisance breaks and shall disconnect at 200 lbs. A hose coupling shall separated the breakaway and hose swivel. The nozzle shall have a means of automatically stopping flow if the nozzle is not at the proper dispensing angle. Nozzle shall be of die-cast construction UL listed and have a flow equalizer to maintain 10 GPM flow. Breakaway, hose coupling, hose swivel, and nozzle shall be as manufactured by Husky or approved equal. Dispenser shall be compatible with vapor recovery systems.

END OF SECTION 02115





## SECTION 02118

### LEAD PAINT ABATEMENT

#### 1.0 GENERAL CONDITIONS

1.01 Related Documents Except as otherwise noted, these Lead-base Paint (LBP) Abatement specifications are intended to be a part of the General Contract Specifications; and, as such, any and all of the General Provisions of the Contract apply also to the work specified herein.

#### 1.02 Definitions

- 1) Applicable Surface: All intact and non-intact interior and exterior painted surfaces of a residential structure.
- 2) Chewable Surface: All chewable protruding painted surfaces up to five feet from the floor or ground, which are readily accessible to children under seven years of age, i.e., protruding corners, windowsills and frames, doors and frames, and other protruding woodwork.
- 3) Containment: The process for protecting both workers and the environment by controlling exposures to lead dust and debris during the abatement process.
- 4) Contractor: Shall mean the Deleading (abatement) Contractor.
- 5) Defective Lead-Based Paint Surface: Paint on applicable surfaces having a lead content of greater than or equal to 1.0 mg/cm<sup>2</sup>
- 6) Defective Paint Surface: Paint on applicable surfaces that is cracking, scaling, chipping, peeling or loose.
- 7) Elevated Blood Lead Level (EBL): Excessive absorption of lead, that is a confirmed concentration of lead in whole blood of 25 mg/dl (micrograms of lead per deciliter of whole blood) or greater.
- 8) Engineering Controls: Measure which are put into place at the work site to insure containment and control and/or the reduction of lead dust exposure.
- 9) EPA Identification Number: A number which is assigned specifically to a generator or transporter of hazardous waste.
- 10) EP Toxicity: A test which is designed to determine if the waste products from abatement are likely to leach hazardous concentrations into the ground water as a result of improper management.
- 11) Exposure Monitoring: The personal air monitoring of a deleading workers air zone to determine the amount or level of contaminants to which he/she is exposed.
- 12) Elevated Blood Lead Level (EBL): Excessive absorption of lead, that is a confirmed concentration of lead in whole blood of 25 µg/dl (micrograms of lead per deciliter of whole





## 02000 - Site Work

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blood) or greater. It is recommended that lower levels be established for women of child bearing age.

- 13) Final Clearance Inspection: An inspection by a qualified inspector to determine whether abatement and clean-up are complete and units tests pass the final clearance standards as set forth herein.
- 14) Generator: Any individual or person(s) who accumulates hazardous material which needs to be contained and removed from a site.
- 15) HEPA or High Efficiency Particle Air: Is a filter which is designed to filter out particles of 0.3 microns or greater from a body of air at the efficiency of 99.97% or greater.
- 16) Lead-Based Paint: A paint surface, whether intact or defective, identified as having a lead content greater than or equal to 1.0 mg/cm<sup>2</sup> or greater.
- 17) Lead Dust: Shall mean dust containing lead, generated by the deterioration of lead-based paint or by environmental factors or by the normal abatement of leaded surfaces, which by itself would cause a hazardous lead condition to exist, i.e., analysis of paint samples taken during the environmental inspection indicating more than 200 µg/sf of lead (using the surface lead dust monitoring method).
- 18) Surface Lead Dust Contamination: Any condition whereby an appropriate surface lead dust sample indicates the presence of greater than 200 micrograms of lead per cubic meters of air.
- 19) Airborne Lead Dust Contamination (Post Abatement): Any interior condition following abatement in which an appropriate air monitoring test indicates eight hour time weighted average of greater than 15 micrograms of lead per cubic meters of air. Post abatement clean-up is mandated until an airborne level below 8 µg/m<sup>3</sup> is attained, or a level equal to the exterior ambient air.
- 20) Abatement Monitoring: A systematic means of inspection to assure compliance with the safety standards contained herein, which shall include, but not limited to, visual inspection, random XRF testing, random air clearance sampling, and random surface lead dust sampling by a qualified inspection firm.

1.03 Compliance with State and Local Laws: Nothing is intended to relieve the contractor of any responsibility for compliance with state or local laws, ordinances, codes or regulations governing lead-based paint testing or hazard abatement. Certain state and local environmental health agencies have regulations governing lead paint abatement. Some states have mandated specific LBP abatement procedures and methods which must be adhered to. Where state and local requirements are more stringent than the Federal regulations, those state and local requirements must be followed by the Deleading Contractor. The (Deleading) Contractor shall consult with any and all applicable agencies prior to beginning the lead abatement project. All work should be in compliance with the Corpus Christi Army Depot LBP Guidelines.

### 1.04 Qualifications of the (Deleading) Contractors

Deleading Contractors must be familiar with the contents of this document, specifically:

- 1) worker protection
- 2) all types of LBP testing



- 3) acceptable and unacceptable abatement methods
- 4) measures for control and containment of lead dust and debris
- 5) disposal requirements.

In addition, the Deleading Contractor must be able to substantiate sufficient prior deleading experience and/or education providing same with the foresight of the prevailing Lead Based Paint abatement techniques and safety practices contained herein.

- A. Applicable Rules and Regulations: Contractors must also be aware of and adhere to all applicable City, local, state and federal regulations pertaining to lead abatement work.
  - B. Contractor Licensing Requirements: Contractor shall possess any and all license(s) as required by the state and/or local agencies governing the LBP abatement site. A current valid copy of said license(s) shall be provided to the Contracting Officer prior to commencement of the abatement work.
  - C. Related Experience Appropriate for Deleading Contractors: Abatement contractors should be experienced in building renovation and restoration, guidelines for control and the handling of toxic and hazardous materials and protection of the environment and the health of all occupants and workers, as per applicable EPA, OSHA, and NIOSH regulations.
  - D. Contractor Insurance Coverage: Contractors performing Lead abatement work shall be covered with comprehensive liability insurance of the occurrence, not claims made, and such other insurance as required by the Contracting Officer, the bonding company, or the contractor General Conditions.
  - E. Over-all Responsibilities: The contractor and sub-contractors are responsible for abating the specified lead paint in a safe manner and in accordance to all specified requirements. The abatement contractor is also responsible for the following:
    - 1) knowledge of general renovation techniques
    - 2) ensure that all requirements of abatement project are met
    - 3) special techniques and work practice training has been provided to all workers and supervisors which relate to the projects specific abatement techniques
    - 4) ensuring the safety of all workers and occupants and preparing a comprehensive worker protection plan and
    - 5) implementing all contractual requirements.
  - F. Worker Right-to-Know: Contractor is required to conduct or have conducted a qualified Worker Right-to-Know training class for all employees.
- 1.05 Qualifications of Deleading Workman: All abatement workers must attend a "Worker Right-to-Know" training class as provided by the Contractor. At a minimum,
- 1) All abatement workers must be familiar with the dangers of lead poisoning.
  - 2) They should be aware of the health effects due to lead exposure and the ways in which to minimize that exposure.



## 02000 - Site Work

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- 3) The workmen should be experienced in the necessary crafts and should be familiar with the specified requirements and methods which are specified herein.
  - 4) All workmen must agree to submit a pre-abatement medical examination and periodic follow-up testing during the ongoing abatement before they will be allowed to perform abatement.
  - 5) The abatement personnel must attend a mandatory worker education and training course.
- 1.06 Supervision and Workmanship: The Contractor shall supply full time competent supervision for proper coordination of this abatement work and have competent, well trained and experienced workmen in each respective trade. The abatement supervisor should be fully knowledgeable in all methods of abatement. He must be aware of the potential for additional lead hazard creation for each of the methods described herein in Part 3.
- 1.07 Quality Assurance; The lead-based paint abatement shall be supervised by a single firm specializing in the type of abatement required so that there will be undivided responsibility for the specified performance of all the component parts and the work performed herein, or performed by other subcontractors as specifically approved by the General Contractor.
- 1.08 Abatement Monitoring (Testing): The primary health hazard during abatement is the airborne lead dust which is a by-product of the abated lead paint. This is a hazard for abatement workers and anyone else who enters the general vicinity of the ongoing abatement. Therefore, tests need to be performed on a pre-determined scheduled basis by an independent qualified lead inspection firm.
- A. Pre-abatement: the Contracting Officer may cause surface lead dust testing to be performed in areas not scheduled to be abated. These tests will determine if contamination pre-exists or has occurred during the sample unit abatement process due to improper containment procedures. These tests will be done prior to the commencement of full scale abatement work.
  - B. Interim-abatement: The Deleading Contractor is required to perform weekly personnel air monitoring during the ongoing abatement to determine the level of airborne lead and the adequacy of the respiratory protection required. Each active abatement worker is monitored. The highest reading of any man shall serve as the basis of respirator protection. The Contractor shall supply the Contracting Officer with results within 10 days of testing. Federal, state or local regulations regarding occupational exposure monitoring should be followed if more stringent than the monitoring required herein.
  - C. Post-abatement: As required by Federal law, final clearance testing shall be performed by a qualified lead inspection firm. Therefore, the Contractor shall cause surface lead dust testing to be done in both abated areas and also in selected areas adjacent to where the abatement has been done. The number of tests to be performed and their location shall be determined by the lead consultants. These tests will determine if re-occupancy is safe. Visual inspection of the abated areas before surface lead dust testing or repainting shall be done by the Lead Consultant so as to determine that all leaded areas were abated as specified and that no visible dust or debris are present.
- 1.09 Surfaces Herein Requiring Abatement:
- A. All Surfaces Specified in Part 3 Herein; Where defective lead-based paint at or above 1.0 mg.cm<sup>2</sup> was found on applicable surfaces, either interior or exterior, of a Corpus Christi Army Depot unit or of a Corpus Christi Army Depot owned or operated childcare facility, the entire wall



or ceiling or other surface shall be treated. In common areas, including interior surfaces or non-dwelling Corpus Christi Army Depot facilities (which are commonly used by children under seven years of age), any applicable surfaces found to contain lead at or above 1.0 mg/cm<sup>2</sup>, treatment shall be provided. Abatement within this comprehensive modernization project should be prioritized in relation to the immediacy of the hazards found to children under seven years of age unless otherwise noted. The Contractor shall consult with the Contracting Officer lead representative for any such applicable priority schedule.

- B. Other Surfaces: On all surfaces that are chalking or contain abatement debris where the lead dust generated from is determined to pose a health hazard (such surfaces may exist after normal abatement has taken place without proper and adequate clean-up or due to pre-existing contamination levels), the Contractor is required to clean to post-abatement FINAL CLEARANCE STANDARDS set forth herein.

- 1.20 Abatement Procedures in this Project; Abatement of the hazard in this project includes, but are not limited to, all of the following as marked "X":

- (X) removal of lead-based paint using on-site or off-site approved stripping methods
- (X) encapsulation of lead-base paint
- (X) proper removal of and replacement of surfaces containing lead-base paint
- (X) thorough clean-up
- (X) post clean-up treatment of surfaces (including floors, walls and ceilings, porches, sidewalks and stairs)
- (X) proper disposal of leaded items
- (X) environmental and medical testing.

At a minimum, abatement must be carried out in conformance with the methods of interior and exterior site preparations.

- 1.21 Unacceptable Methods of Abatement: The following are prohibited by this the Contracting Officer and by state and federal regulations and are unacceptable due to their potential for contaminating the environment.

- A. Open abrasive blasting
- B. Uncontained water blasting
- C. Grinding or sanding without attached HEPA vacuum filtration system
- D. Gas fired open-flamed torches
- E. Methylene chloride based chemical stripping compound

- 1.22 Required Methods of (Interior) Site Preparation: The methods so used in this abatement plan call for breaking or disturbing of lead-painted which will generate airborne lead dust; therefore, the contractor shall make necessary site preparations prior to abatement which shall consist of the following measures:



## 02000 - Site Work

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- (1) Contractor shall post warning signs at least 16" by 20" with 3" letters that reads: Danger: DO NOT ENTER. LEAD PAINT ABATEMENT WORK IN PROGRESS. Signs shall be posted at all entrances and exits at least 48 hours in advance.
- (2) Contractor shall determine from the Contracting Officer if the removal of all belongings and furnishings of said occupants (where possible) has occurred.
- (3) Contractor shall determine from the Contracting Officer if all belongings and furnishings have been relocated into the center of the room. Contractor is then responsible for covering above mentioned items completely with 6 mil plastic and duct taping all seams and edges to floor.
- (4) Contractor shall determine any correction of conditions that can impede abatement (i.e. water leaks etc.)
- (5) Contractor, with the Contracting Officer's approval, shall correct conditions that may cause abatement to fail; costs of which shall be added to or deducted from the contractor Work Order Price Proposal.
- (6) Contractor shall install engineering controls to contain all leaded dust and debris so as to protect surfaces which cannot be removed.
- (7) Contractor shall clean, at his expense, furnishings, carpets and belongings which may inadvertently become contaminated during abatement if the measures contained herein are not followed. Immediately after abatement, these items, if determined to be contaminated, shall be cleaned. Contractor, at his expense, may determine if a pre-existing condition exists, and may, upon proof, pre-exempt post abatement re-cleaning.
- (8) Following the removal or covering of all movable objects from the immediate work area, the contractor must seal the work area from any nonwork areas. All work areas must be sealed off (i.e. a room within a unit or a unit within a building) with 6 mil polyethylene sheeting attached to framing. In order to create an effective barrier between work areas and non-work areas, the use of two layers of 6 mil polyethylene is required. The first sheet must be attached to the top of the opening and one side. The second sheet shall be attached to the top and the opposite side, creating an "s" shaped entrance way which helps deter the escape of lead dust.
- (9) After the work area(s) have been sealed off, the Deleader shall do the following in those work areas:
  - A. Cover all non-movable items.
  - B. Cover all floors.
  - C. Shut down all forced air conditioning and air heating systems and seal all air intake and exhaust points of these systems.
  - D. All cabinets, closets and drawers must be sealed with tape so as to prevent contamination by lead dust and/or lead particles.
  - E. All ingestibles must be removed from any room or area under abatement.

1.23 Required Methods of Exterior Site Preparation: Exterior abatements potentially generate large quantities of liquid and/or dry waste. This lead waste can contaminate the environment outside and also adjacent units, therefore, the following precautions must be taken by the Contractor:



- A. Containment for Liquid Waste: The Contractor shall:
    - 1. Place polyethylene plastic sheeting (6 mil thick) as close to the building foundation as possible (out to a minimum of four feet).
    - 2. Stretch the edge of the sheets a sufficient distance to stop the runoff and raise the outside edge plastic sheets (using 2x4's) so that liquid waste is contained.
    - 3. Have proper containers to hold liquid waste for later transfer and disposal.
    - 4. Where seams occur, they must be sealed with tape and edges must be raised with 2x4 framing and a new section of plastic sheeting and framing must be added as needed.
    - 5. Collect and properly dispose all liquid waste in EPA approved containers, as per RCRA regulations.
  - B. Containment for Dry Waste: The contractor shall:
    - 1. Place polyethylene plastic sheeting (6 mil thick) as close to the building foundation as possible.
    - 2. Stretch the plastic sheeting out from the foundation a distance of three feet per story being abated with a minimum of five feet and a maximum of 20 feet.
    - 3. Hold the plastic sheeting at the foundation and along the edges and seams.
    - 4. Construct vertical shrouds if constant wind speed exceeds 15 mph or if there is visible movement of debris.
    - 5. Clean-up all dry waste as needed to avoid contamination, at a minimum of once daily.
  - C. If a common area is an abatement work area, and there area no secondary entrances or exits that are located outside the work area, then the Deleading Contractor should create a protective walkway through that common area.
- 1.24 Additional Lead Dust Controls: The Contractor is hereby advised of these additional safety precautions of which he is responsible to enforce:
- A. To avoid unnecessary exposures to lead and to limit the tracking of lead dust and debris, the Deleading Contractor must limit access of the nonworkers to those designated abatement work areas. The abatement work crew supervisor is responsible for minimizing and enforcing this control.
  - B. Those entering a work area during a lead abatement job which involves the breaking or the disturbance of lead-paint surfaces must wear disposable shoe covers which must be removed immediately when leaving the work area and placed with all other abatement waste items. Any person(s) who enter the work area during active removal or demolition must wear appropriate respirator protection.
  - C. The importance of ongoing clean-up in the work area to control lead dust and debris is very important. The frequency and intensity of cleaning will be the greatest with on-site removal methods and methods that create a lot of construction debris. Regular cleaning of all tools, equipment, and worker protection gear must be part of the ongoing clean-up.



## 02000 - Site Work

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- 1.30 Safety Requirements To protect the health and safety of all persons involved, it is of the utmost importance that deleading is safely and correctly done in a timely manner. The following specific safety requirements are the responsibility of the Deleading Contractor.
- 1.31 General Safety:
- (1) NO ONE is to be allowed in the work area without an approved respirator except for methods that have been documented not requiring a respirator.
  - (2) Each work area must be sealed from the remainder of the dwelling by taping plastic sheets (6 mil thick). Work areas must remain sealed off until both work and clean-up are completed.
  - (3) Cover all floors, carpets, furniture and appliances with 6 mil plastic within the work area. Use automotive masking tape (2 inches wide) to seal all edges and seams.
  - (4) Make certain all electrical connections are properly grounded.
  - (5) At least three days prior to the start of any deleading work, post appropriate warning signs at all entrances and exits of work areas and leave in place until all clearance testing indicates that these areas are safe for re-occupancy. The signs must include the following phrase: "CAUTION LEAD HAZARD-KEEP OUT". Post bilingual signs when necessary.
- 1.32 Worker Safety: The Deleading Contractor shall take the following minimum precautions to protect the health of all individuals involved in the deleading process.
- A. Pre-Abatement Medical Exam: Each employee shall undergo a medical examination to determine both respiratory fitness capability and also pre-existing/current blood lead level. Said results shall be provided to the employee and also to the Contracting Officer within 3 days of receipt of same, and in all cases, prior to employee's commencement to active abatement. Records of same are required to be kept by the Contractor for 40 years.
  - B. Medical Surveillance is the monitoring of worker blood levels. It is required that the Contractor have blood level monitoring of all active abatement and clean-up workmen and on-site supervisors performed and said results provided to the Contracting Officer.
    1. Before assignment to active abatement activity for each worker.
    2. 30 days after active abatement has begun.
    3. At least every two months during the first six months and every six months throughout the deleading job.
    4. At least every two months for each employee whose blood lead analysis indicated a blood lead level at or above 25 micrograms per deciliter. (20 micrograms per deciliter for women of child bearing age).
    5. At termination of employment.
    6. Contractor shall reassign any employee whose blood lead has reached 25 µg/dl (20 µg/dl for women of child bearing age) to a job function deemed safe from lead exposure. Said employee shall remain away from active abatement until such time as 2 consecutive months' blood tests indicate µg/dl below 20 µg/dl.
  - C. Respiratory Protection Programs must be established by the Contractor in accordance with OSHA regulations and qualitative respirator fit testing must be conducted daily by the on-site





supervisor. Medical examinations must be performed by a physician prior to fit testing and at anytime when a worker demonstrates any difficulty breathing during the use of or the fit testing of respirators. The following are minimal acceptable respiratory protection program requirements as set up and administered by the Contractor:

1. Written standard operating procedures which oversees the selection and use of respirators.
2. Selection of respirators on the basis of hazards to which the worker is exposed.
3. Worker training on the limitations and use of respirators (includes fit testing).
4. Individual workers assigned respirators for their exclusive use only.
5. Daily cleaning and disinfecting of respirators.
6. Proper storage of all respirators.
7. Proper inspection of all respirators for wear and tear.
8. Continual surveillance of work area conditions and level of worker exposure or stress.
9. Use of approved respirators only, modified as needed by the weekly exposure monitoring results.
10. Supply weekly report covering items 1-9 to the Contracting Officer or its Lead Consultant.

Exposure Monitoring is the measured concentration of lead in the workers breathing zones. The Contractor shall perform personnel monitoring during active abatement using the NIOSH 7072 method and shall be responsible for:

1. Monitoring the level of worker protection needed during the abatement process;
  2. Evaluating, modifying and improving any engineering and work practice control(s) as needed;
  3. Evaluating each employee's personal quality of work and any need for additional worker training or safety instruction;
  4. Providing the Contracting Officer results of all personnel monitoring tests within 10 days of testing; and
  5. Providing half-face APR respirators with HEPA filters unless said monitoring test results dictate differently. OSHA guidelines shall be used to determine respirator PEL protection factors.
- E. Protective Clothing Equipment must be provided to all workers to help assure that lead dust is contained to the work areas. The following must be supplied/enforced by the Deleading Contractor:
1. Full body protective clothing and shoe covers of appropriate sizes on a daily basis or as needed.
  2. Clean changing areas separated from the dirty/contaminated clothes storage area.
  3. Water and wash facilities for washing of hands and face and shower facilities if deemed necessary by the Contracting Officer's Lead Advisor.





## 02000 - Site Work

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4. Instructing worker on proper maintenance of clothing and equipment.
5. Proper disposal of disposable clothing and proper permanent work clothes.
6. Enforcing the removal of protective clothing at the end of each work day and before eating, drinking and smoking.
7. Enforcement of the removal of protective shoe covers before leaving work area.

### 1.33 Contractor/Worker Daily Safe-Work Procedures

#### A. Daily Start-Up:

1. Workers to put on protective gear prior to entering work areas.
2. All garment seams to be sealed with duct tape.
3. All non-working garments must be stored in designated changing area.
4. Respirators, as required, must be properly fitted before entering work area. Perform qualitative fit test.

#### B. Temporary depart:

5. All protective clothing to be HEPA vacuumed while still being worn.
6. All shoe covers to be removed and left in the work area (immediate departure upon removing).
7. Remove all protective gear in designated "contaminated" changing area before eating, drinking, and smoking or before leaving work site.
8. Wash hands and face.
9. Clean respirators.

#### C. Daily Shut-Down:

10. Dispose of protective clothing with abatement waste by sealing in a 6 mil poly bag.
11. Laundered clothes must be placed in closed container.
12. Wash hands and face.
13. Shower if facilities allow and circumstances dictate.
14. Clean all protective gear (respirators included).

### 1.34 Tenant's Safety: Temporary relocation of the tenants is necessary if the lead paint surface is broken. Temporary relocation of the tenants and their belongings is the responsibility of the Contracting Officer. However, the Contractor has the joint responsibility to administer and enforce the following safety practices on behalf of the occupants:

#### A. Adults

1. NO OCCUPANT is allowed to enter the work area during paint removal and initial clean-up. A three day clean-up and settlement period may be imposed depending upon the abatement procedures used, at the discretion of the Contracting Officer or their Lead Consultant.



2. Contracting Officer shall notify all occupants in writing when they are allowed to return to their post-abated residence. Contractor shall abide by these notices.
3. Every resident who has received prior notice of abatement is responsible for placing all personal items (clothing, dishes, linens, etc.) in closed, easy to handle containers; and move such items to the center of each room as requested.
4. As long as visible dust remains, occupants may not occupy dwelling, and all surfaces within the dwelling must be re-washed with trisodium phosphate and HEPA vacuumed by deleading contractor.
5. Persons reoccupying dwellings following abatement are required to report any visible dust or debris to the Contracting Officer immediately for additional Contractor clean-up.

B. Pregnant Women and Children

ABSOLUTELY NO PREGNANT WOMEN OR CHILDREN UNDER THE AGE OF TWELVE YEARS OF AGE MAY BE ALLOWED IN THE BUILDING WHILE ANY PART OF THE ABATEMENT PROCESS IS GOING ON.

2.0 Clean-up, Inspection and Disposal

2.1 Clean-up

- (1) The contractor shall be required to perform thorough daily clean-up of the work area during the entire abatement process. It is imperative the daily clean-up is scheduled at the end of each work day after active abatement has ceased.
- (2) The following are the steps that the Contractor must take during the preliminary final clean-up Phase:
  - A) The removal of plastic sheeting must be done before final clean-up can begin (plastic sheeting which was used to protect non-work areas from work areas should be left in place). The plastic sheeting must be carefully folded and placed in 4 mil doubled or 6 single mil plastic bags and removed from the area.
  - B) The entire affected area must be HEPA vacuumed as follows; All surfaces which could have been affected by the deleading process must be thoroughly HEPA vacuumed. The surfaces include but are not limited to walls, ceilings, windows (well, sill, sash), doors, jambs, light fixtures, cabinets, shelves and appliances. All surfaces must include abated and non-abated areas. Vacuuming must start with the ceiling and work downward.
  - C) After HEPA vacuuming, the entire affected area must be washed down with a high phosphate detergent of 5% trisodium phosphate phosphate. (Some states have regulated T.S.P. use, check in the area in which abatement is taking place.) All areas which were vacuumed must be thoroughly washed down. The process of washing must begin from the ceiling and work downward. Workers are required to wear rubber/neoprene gloves for hand protection. WARNING; T.S.P. has a pH and can cause skin burns.
  - D) The entire affected area must be re-HEPA vacuumed as detailed in B) above, following the wash/mop down.



## 02000 - Site Work

- 2.2 Interim Final Inspection: Following the preliminary clean-up, the Contractor is to attend an initial (interim) final inspection. The Contractor shall notify the Contracting Officer and the Lead Consultant a minimum of 7 days in advance that this preliminary clean-up has been completed.
- A. the Contracting Officer shall cause an independent inspector (Lead Consultant) to visually inspect all the surfaces which required abatement. Surface lead dust samples shall also be taken to insure all contaminated dust has been removed. No other work within said unit may proceed until test results have passed clearance.
  - B. If any of the results of the above inspection are unsatisfactory, then no other construction work may proceed in the unit until those areas which need re-abating and/or recleaned will be done until all subsequent inspection results are deemed satisfactory. The cost of the additional clean-up and also all the costs of re-testing by the Lead Consultant will be the responsibility of the Contractor.
  - C. Units which have passing clearance test results may be released by the Contracting Officer for subsequent scheduled work.
  - D. Following the Interim Final Inspection, the Contractor shall paint and seal all abated surfaces as the last step cleaning process.
- 2.3 Final Clean-up This must be done after all painting and sealing has been completed. It will consist of the following:
- The Contractor shall see that:
- (1) The entire affected area must be HEPA vacuumed as described in the preliminary clean-up section of this document.
  - (2) The entire affected area must be washed down with high phosphate detergent as detailed in the preliminary clean-up section of this document.
  - (3) Final clean-up step is to re-vacuum with HEPA vacuum as detailed in the preliminary clean-up section of this document.
- 2.4 Final Inspection:
- (1) Entire affected area must be visually inspected by an independent inspector to ensure that all abated surfaces have been painted and/or sealed.
  - (2) Surface lead dust tests may be taken by the final Inspector on all surfaces deemed suspect. Said test results must pass within the standards contained herein Section 2.04.
- 2.5 Clearance Standards: The following are the standards by which lead dust is deemed unacceptable:
- A. Floors - 200 micrograms of lead/square foot or above
  - B. Window Sills - 500 mg of pb/sf or above
  - C. Window Wells - 800 mg of pb/sf or above
- 2.6 Disposal Requirements: The Deleading Contractor must dispose of lead based paint debris in accordance with applicable local, State, or Federal Requirements. Contractor is required to advise the Contracting Officer as to proper disposal; and provide same with a complete written report of all disposal activities whether hazardous or non-hazardous. Disposal Checklist:



The Contractor shall do the following:

1. Contact regional EPA to determine requirements (EPA 1-800-424-9346).
2. Perform laboratory EP Toxicity Leachate test on representative samples to determine if waste is hazardous or non-hazardous. A result of 5 parts per million is considered toxic and hazardous, requiring special disposal by a licensed Hazardous Waste Disposal Firm.
3. Secure and post appropriate warning signs at the temporary storage areas. Signs shall be no less than 16" x 20" with 3" lettering and shall read "DANGER CONTENTS CONTAIN LEAD-DO NOT REMOVE".
4. All nonhazardous waste must be trucked off site in covered truck to landfill following notification and approval of said landfill to receive leaded construction material.
5. EPA identification number must be obtained for hazardous waste.
6. A hazardous waste "Manifest" for shipping must be obtained from the HW Carrier. A copy to the Contracting Officer.

Specific Disposal Method to be Followed:

1. Determine if any of the paint wastes and or solvent wastes are hazardous.
2. Place all debris, paint chips, HEPA Vac bagged dust, and other such lead dust into 6 mil single layer or 4 mil double layered plastic bags and test the contents for leachable lead using the EPA Leachate Test characteristic of Extraction Procedure toxicity as set forth in Test Methods for Evaluating Solid Wastes (SW- 846) Method #1310. If the analysis Leachate results are equal to or exceed 5.0 milligrams per liter or 5 parts per million (ppm), then the accumulated bagged waste contents must be disposed of in a low level hazardous waste site. NOTE: If the total weight of all accumulated lead debris is less than 100 kilograms, advise EPA of matter in writing and request permission to waive the necessity of disposal of same in a low level toxic waste site. A written confirmation provided to the Contracting Officer by the contractor from EPA on this specific subject must be obtained in order to waive this disposal requirement.
3. If organic solvents are used during the stripping process, then the spent solvent waste and residue would meet the definition of listed hazardous waste. Depending on the constituents of the solvent, the waste would be identified as either F001, F002, F003, F004, or F005.
4. Nonhazardous waste from the lead abatement must be disposed as follows:
  - a. All vehicles must be covered and waste taken to a landfill (preferably lined).
  - b. None of the waste will be disposed of through residential or commercial trash collection.
  - c. If dumpster service is used, the company must be told of the content of lead and the dumpster must also be covered in transit.
  - d. Contain and properly dispose of liquid waste.
5. If any of the wastes are determined to be hazardous wastes, then the deleading contractor must obtain a USEPA identification number. Do the following:



## 02000 - Site Work

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- a. Contacting your state EPA office, requesting USEPA form 8700-12. Must complete the form, send back. The form will then be forwarded to USEPA Region Office and a permanent identification number will be assigned--usually within 3 to 6 weeks, or
  - b. Requesting a temporary identification number from your state EPA office based on a one-time emergency situation. Each request will be evaluated upon an individual basis.
6. Any hazardous waste collected must be stored in proper D.O.T. approved containers. The containers must be labeled "Hazardous Waste" and once full, dates of accumulation must be placed on them. When not in use, all containers must be secured. "Danger Unauthorized Personnel Keep Out" signs must be placed around the waste storage area and must be visible from all directions of approach.
7. All hazardous waste containers must meet all D.O.T. requirements for packaging and labeling before transport.
8. Lead abatement waste shall be transported and disposed of in a manner to prevent lead from becoming airborne.
9. An EPA manifest form must be supplied from the Hazardous Waste Carrier prior to transporting the waste. The original copy of the manifest must be kept for at least 3 years. A copy to the Contracting Officer with same.

### 2.7 Special Abatement Procedures:

It is clearly the deleading contractor's responsibility to respond with any and all additional work, labor, clean-up, and materials as deemed necessary to satisfy the established Abatement Standards, as contained herein, Section 2.4 Initial costs of abatement monitoring and also the post-abatement unit re-inspection will be incurred by the Contracting Officer. Any subsequent re-testing as deemed necessary by virtue of unsatisfactory test results, i.e., failure to meet abatement standards contained herein, shall be borne by the Deleading Contractor. Retests shall be made until such time as satisfactory results are attained.

### 2.8 Severability:

The provisions of these specifications are hereby declared severable. If any word, phase, clause, sentence, paragraph, section or part in or of these specifications or the application thereof to any person, circumstances or thing is declared invalid for any reason whatsoever, the remaining provisions to other persons, circumstances or things shall not be affected thereby but shall remain in full force and effect. The City hereby declaring that it would have without the word, phrase, clause, sentence, paragraph, section or part, or the application thereof, so held invalid.

### 3.0 Execution, Products and Specific Techniques

The Deleading Contractor shall use only the products listed herein (or approved equals) for any and all abatement of lead-base paint in this project.

#### 3.1 Approved Products: The approved products are grouped according to the abatement technique that is to be specified.

- A. Stripping of Lead-Base Paint



1. Peel-Away or Chemstrip
  2. Dry scraping with mist (oil or water)
  3. Off-site dipping
  4. Heat gun stripping (not to exceed 160 F)
- B. Encapsulation of Lead-Base Paint
1. Lead Encapsulation system by Fiber-Tec, Pentagon Plastics & Universal Plastics
  2. 22 ga. galvanized metal "bent" to fit
  3. Aluminum or vinyl soffit material
- C. Removal, Replacement of Lead-Base Paint clad items
- No products specified. Disposal guidelines must be followed.
- D. Product Warranty - Contractor shall provide to the City an exclusive 20 year letter of warranty from the manufacturer of the encapsulation products used. Said warranty shall guarantee the life expectancy during normal wear and tear of the manufacturer's encapsulation product(s) for not less than 20 years.

### 3.2 Execution

The Deleading Contractor shall supply all labor, materials and equipment necessary and required to complete the lead base paint abatement work as specified.

Work Includes: In general, the work under this Contract shall include, but is not necessarily limited to the following:

- 1) Stripping lead base paint from existing walls, woodwork, porch poles and other surfaces.
- 2) Removing some or all metal items and/or all wood and/or wood trim, i.e., door/window casings, frames, shelving, shelving supports, railings, or other metal or wooden items which have been painted with lead base paint.
- 3) Patching walls and ceilings.
- 4) Installing new 1/2" drywall on all abated wall and ceiling surfaces.
- 5) Installing new wood where "leaded wood" was removed. To be done by General Contractor.
- 6) Painting of all (abated) walls and/or wood trim and other abated surfaces with 2 coats of paint which when dried will have a lead content in the dried state of less than 0.006% lead. To be done by the General Contractor.
- 7) Performing clean-up as required in Disposal Requirements, Part 2.50.
- 8) Disposal of discarded leaded items, i.e., paint scrapings, chemically stripped paint waste, door jambs of casings, case molding, casement, handrails, or other items having a lead content unacceptable to EPA for normal "local" disposal. See Part 2.50.
- 9) Proper and safe storage of delivered materials on the project site with said materials having the manufacturer's labels intact and legible.



## 02000 - Site Work

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- 10) Performing additional "Health Hazard" clean-up as mandated by Contracting Officer.
- 11) Encapsulation of lead paint surfaces so as to eliminate any and all accessibility to the underlying lead. To be done by the General Contractor.

### 3.3 Specific Techniques;

1. Front and Rear Entry Doors and Jambs - Use temporary-portable containment screens, and carefully remove existing entry doors and jambs. Clean area immediately as set forth in Part 2.; and dispose of same in accordance with Part 2. Following clean-up, replace with new doors and jambs as per the General Specifications.
2. Interior Doors - Following instructions in No.1, remove existing doors and dispose of properly. Clean-up each area immediately. Replace with new doors as called for in the General Specifications.
3. Interior Door Jambs -
  - (A) BATH DOORS- Remove jambs and dispose of same as per instructions in No.1. Replace with new jambs as approved.
  - (B) All other interior door jambs are to be stripped on site using only those abatement techniques, Part 3, and containment procedures as approved in Part 2. Following clean-up and disposal of liquid residue, prime and repaint with approved color paint.

NOTE: Lead contaminated residue shall be stored in U.S.E.P.A. approved hazardous waste shipping barrels until a representative sample of same has passed the appropriate EPTox Test. Contractor is responsible for one EPTox test per 55 gal. drum. Provide the Contracting Officer with copy of results within 10 days receipt of same.
4. Interior Stair Stringers - LBP is to be stripped on site, using procedure outlined in No.3.(B).
5. Interior Stair Risers - Following the abatement and clean-up of the stair stringers, encapsulate all risers and step treads with approved encapsulate as called for in the General Specifications.
6. Shelf Supports - Remove and replace using procedure as outlined in No.1.
7. Old Windows and Casings - Remove only those OLD windows and casings as listed in the General Specifications; and replace with new windows and casings as approved. Follow exterior containment and removal clean-up/disposal procedures as called for in Part 2.
8. Window and Door Brick Lintels - Clean off any and all grime and grit. Encapsulate with fiberglass coating material as described in Part 3. Color to be approved. Said encapsulation shall eliminate any and all accessibility to the underlying LBP.
9. Additional Abatement Procedures - Specific - The contractor is required to have EPTox Tests performed on each LBP group of building components to be disposed of. The results of each test shall determine the final proper disposal for that particular group. EPTox Test results, a copy of the hazardous waste carrier's manifest, and a receipt from the landfill denoting final destination ( either a Sanitary or a Low-level toxic waste landfill) shall be provided to the Contracting Officer within 10 days receipt of same. One or more EPTox Test shall be performed on each group of the following:
  - a. Entry JAMBS only



- b. Bathroom Door Jambs
- c. Stair Stringers- liquid LEP residue
- d. Old Windows and Casings
- e. Shelf Supports

END OF SECTION 02118





## 02000 - Site Work

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### SECTION 02210

#### SITE GRADING

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing of labor, materials and equipment for site grading.
- 2.0 PRODUCTS: Borrow material shall be selected to meet requirements and conditions of the particular fill for which it is to be used. Necessary clearing, grubbing, disposal of debris, and satisfactory drainage of borrow pits shall be performed by the Contractor. The source of borrow material shall be the Contractor's responsibility. Exporting and disposing of excess material shall be the Contractor's responsibility.
- 3.0 EXECUTION:
  - 3.1 Topsoil shall be removed without contamination with subsoil and stockpiled convenient to areas for later application or at locations designated. Topsoil shall be removed to full depth and shall be stored separate from other excavated materials and piled free of roots, stones, and other undesirable materials.
  - 3.2 Excavation: After all stripping has been completed, excavation of every description, regardless of material encountered, within the grading limits of the project shall be performed to the lines and grades designated. Satisfactory excavation material shall be transported to and placed in fill areas within the limits of the work. All unsatisfactory material and surplus material shall be disposed of in areas approved for surplus material storage.
  - 3.3 Preparation of Ground Surface for Fill: All vegetation, such as roots, brush, heavy sods, heavy growth of grass, and all decayed vegetable matter, rocks, rubbish, and other unsatisfactory material within the area upon which fill is to be placed shall be stripped or otherwise removed before the fill is started. Sloped ground surfaces steeper than one vertical to four horizontal on which fill is to be placed shall be plowed, stepped, or broken up as directed, in such manner that the fill material will bond with the existing surface.
  - 3.4 Fills and Embankments: The completed fill shall conform to the shape of the typical sections indicated or shall meet the requirements of the particular case. Fill shall be satisfactory material and shall be reasonably free from roots, other organic material, trash, and stones having a maximum diameter greater than 6 inches. No frozen material will be permitted in the fill. Stones having a dimension greater than 4 inches shall not be permitted in the upper 6 inches of fill or embankment. Construction debris shall not be buried on-site unless permitted in writing by the Contracting Officer. All construction debris shall be routinely removed from the site and shall not be permitted to mix with soil on the site.
  - 3.5 Finished Excavation, Fills, and Embankments: All areas covered by the project, including excavated and filled sections and adjacent transition on areas, shall be uniformly smooth graded. The finished surface shall be reasonably smooth, compacted, and free from irregular surface changes.



## 02000 - Site Work

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- 3.6 Placing Topsoil: On areas to receive topsoil, the compacted subgrade soil shall be scarified to a 2-inch depth for bonding of top soil with subsoil. Topsoil then shall be spread evenly and graded to the elevations and slopes shown. Topsoil shall not be spread when frozen or excessively wet or dry.

END OF SECTION 02210



## 02000 - Site Work

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### SECTION 02211

#### ROCK REMOVAL

- 1.0 DESCRIPTION OF WORK: This specification covers removal of rock. Operating procedures shall be in accordance with the equipment manufacturer's recommendations and all local codes. Demolition and removal of material shall be as required to support the work.
- 2.0 PRODUCTS : (Section not used.)
- 3.0 EXECUTION:
  - 3.1 Preparation:
    - 3.1.1 Review the site for existing features and conditions (such as buildings, utilities, adjacent property owners) that will require protection or other coordination of the work.
    - 3.1.2 Clear the area and excavate as required to provide access to the rock to be removed.
    - 3.1.3 Provide Bracing, Shoring, Etc., as required to safely execute the work.
    - 3.1.4 Provide Dewatering as required.
  - 3.2 Removal
    - 3.2.1 Remove Rock to the lines required or designated. Provide level bearing surface for footing, pilecaps, etc.
    - 3.2.2 Haul Excavated Materials to the area designated.

END OF SECTION 02211



## SECTION 02221

### EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for excavation, trenching, and backfilling for utilities systems.
- 2.0 PRODUCTS:
  - 2.1 Satisfactory Materials: Satisfactory materials shall consist of any cohesionless materials classified by MIL-STD-619 as GM, GW, GP, SM, SM SW. Materials classified as GM and SM will be identified as cohesionless only when the fines are nonplastic.
  - 2.2 Select Granular Material: Select granular material shall consist of well-graded sand, gravel, crushed gravel, or crushed slag composed of hard, tough, and durable particles.
- 3.0 EXECUTION:
  - 3.1 Excavation: During excavation, material satisfactory for backfilling shall be stockpiled at a sufficient distance from the banks of the trench to prevent slides or cave-ins. Excavated material not required or not satisfactory for backfill shall be removed from the site. Unsatisfactory material shall include but not be limited to material containing organics and building debris.
    - 3.1.1 Trench Excavation: Trench walls below and above the top of the pipe shall be sloped or made vertical, depending on the type of pipe used and the soil conditions. Trench width below the top of the pipe shall not exceed 24 inches plus pipe outside diameter (OD) for pipes of less than 24-inch inside diameter and shall not exceed 36 inches plus pipe OD for larger sizes. The bottoms of trenches shall be accurately graded to provide uniform bearing and support for the bottom quadrant of each section of the pipe. Bell holes shall be excavated to the necessary size at each joint or coupling to eliminate point bearing. Stones of 3 inches or greater shall be removed to avoid point bearing.
    - 3.1.2 Removal of Unyielding Material: Where unyielding material is encountered in the bottom of the trench, such material shall be removed 4 inches below the required grade and replaced with select materials and compacted.
    - 3.1.3 Removal of Unstable Material: Where unstable material is encountered in the bottom of the trench, such material shall be removed to the depth directed and replaced to the proper grade with select granular material placed in layers not to exceed 6 inches before compaction.
    - 3.1.4 Excavation for Appurtenances: Excavation for manholes, catch-basins, inlets, or similar structures shall be of sufficient size to permit the placement and removal of forms for the full length and width of structure footings and foundations when needed.
  - 3.2 Backfilling: Backfill material shall be placed in layers of 8 inches before compaction unless otherwise specified. Each layer shall be compacted to at least 95 percent density in accordance with ASTM D 968. Water flooding or jetting will not be permitted.



## 02000 - Site Work

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- 3.2.1 Sidewalks, Turfed or Seeded Areas, and Miscellaneous Areas: Backfill shall be deposited in layers of a maximum of 12 inch before compaction and compacted to 95 percent maximum density as directed by the Contracting Officer. Water flooding or jetting methods of compaction will be permitted for granular non-cohesive backfill material. Water jetting will not be allowed to penetrate the initial backfill.
- 3.2.2 Trench Backfill: Trenches shall be backfilled to the grade required in 6" to 8" lifts. The trench shall be backfilled to 2 feet above the top of pipe prior to performing the required pressure tests. The joints and couplings shall be left uncovered during any required pressure tests.
- 3.2.3 Displacement of Sewers: After other required tests have been performed and the trench backfill compacted to 2 feet above the top of the pipe, the pipe shall be inspected to determine whether significant displacement has occurred. If the interior of the pipe shows poor alignment or any other defects that would cause improper functioning of the system, the defects shall be remedied as directed.
- 3.3 Special Requirements: Special requirements for both excavation and backfill relating to the specific utilities are as follows:
  - 3.3.1 Gas Distribution: Trenches shall be excavated to a depth that will provide not less than 18 inches of cover in rock excavation and not less than 24 inches of cover in other excavation.
  - 3.3.2 Water Lines: Trenches shall be excavated to a depth that will provide a minimum cover required for frost protection, or from the indicated finished grade, whichever is lower, to the top of the pipe. For fire protection yard mains or piping, the depth of cover shall comply with Federal, State, County and City Standards.
  - 3.3.3 Heat Distribution System: Trenches shall be excavated to a depth that will provide a minimum cover required for frost protection. Initial backfill material shall be free of stones larger than 1/4 inch in any dimension.
  - 3.3.4 Electrical Distribution System: Direct burial cable and conduit or duct line shall have a minimum cover of 24 inches from the finished grade, unless otherwise required.

END OF SECTION 02221



## SECTION 02222

### STRUCTURAL EXCAVATION

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing of labor and equipment for structural excavation.
- 2.0 PRODUCTS: (Section not used.)
- 3.0 EXECUTION:
- 3.1 General: The excavation shall include trenching for utility and foundation drainage systems to a point 5 feet beyond the building line of each building and structure. Unsatisfactory material shall be removed, and satisfactory material shall be placed and compacted. Unsatisfactory material shall include but not be limited to material containing organics and building debris.
- 3.2 Drainage: Excavation shall be performed so that the area of the site and the area immediately surrounding the site and affecting operations at the site will be continually and effectively drained.
- 3.3 Utility and Drain Trenches: Trenches for underground utilities systems and drain lines within 5 feet of the building or structure shall be excavated to the required alignments and depths. The bottoms of trenches shall be graded to secure the required slope and shall be tamped if necessary to provide a firm pipe bed.
- 3.4 Borrow: Where satisfactory materials are not available in sufficient quantity from required excavations, approved materials shall be obtained from approved sources.
- 3.5 Excavated Materials: Satisfactory excavated material required for fill or shall be placed in the proper section of the permanent work required under this section or shall be separately stockpiled if it cannot be readily placed.
- 3.6 Final Grade of Surfaces of Support Concrete: Excavation to final grade shall not be made until just before concrete is to be placed. For pile foundations, the excavation shall be stopped at an elevation 6 to 12 inches above the bottom of the footing before driving piles. Level rock to provide even bearings. Rock shall be worked down to a satisfactory bed or sidewall.
- 3.7 Filling and Subgrade Preparation: Satisfactory materials free from roots, debris, or stones larger than 3 inches shall be used in bringing fills to the lines and grades indicated and for replacing unsatisfactory materials.
- 3.8 Backfilling: Backfilling shall not begin until construction below finish grade has been approved; underground utilities systems have been inspected, tested, and approved; forms have been removed; and the excavation has been cleaned of trash and debris. Backfill shall be brought to indicated finish grade and shall include backfill for outside grease interceptors and underground fuel tanks. Backfill shall not be placed against foundation walls prior to 7 days after completion of the walls. As far as practicable, backfill shall be brought up evenly on each side of the wall and sloped to drain away from the wall.

END OF SECTION 02222



## 02000 - Site Work

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### SECTION 02226

#### SITE EXCAVATION AND FILL

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of material for site excavation and fill.
- 2.0 PRODUCTS: Satisfactory materials shall consist of cohesionless materials classified by ASTM D 2487 as GW, GP, GM, SM, and SW. Materials classified as GM and SM will be identified as cohesionless only when the fines are nonplastic.
- 3.0 EXECUTION:
- 3.1 Excavation: The Contractor shall perform excavation of every type of material encountered within the limits of the project, to the required lines, grades, and elevations. Satisfactory excavated materials shall be placed in fill or embankment within the limits of the work. Unsatisfactory materials encountered within the limits of the work shall be excavated below grade and replaced with satisfactory materials. Unsatisfactory material shall include, but not be limited to, material containing organics and building debris.
- 3.2 Ditches, Gutters, and Channel Changes: Excavation of ditches, gutters, and channel changes shall be to the required cross sections, grades, and elevations. Backfill shall be thoroughly compacted satisfactory material.
- 3.3 Selection of Borrow Material: Borrow material shall be selected to meet the requirements and conditions of the particular fill or embankment for which it is to be used. Borrow material shall be obtained from approved sources.
- 3.4 Backfill: Backfill adjacent to any and all types of structures shall be placed and compacted in such a manner as to prevent wedging action or eccentric loading upon or against any structure.
- 3.5 Embankment: Earth embankments shall be constructed from satisfactory materials free of organic or frozen material in the embankment and rocks with any dimension greater than 4 inches in the upper 8-inch layer. The material shall be placed in successive horizontal layers of loose material not more than 8 inches in depth.
- 3.6 Compaction Requirements: Satisfactory material shall be compacted to 95 percent maximum density or in conformity with ASTM D 698.
- 3.7 Subgrade Preparation: Subgrade shall be shaped to line, grade, and cross section, and compacted to 95% of ASTM D 698. Soft or otherwise unsatisfactory material shall be removed and replaced with satisfactory excavated material or other approved material.

END OF SECTION 02226



## SECTION 02231

### FIELD TESTS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing of labor and equipment for soils compaction testing.
  - 2.0 PRODUCTS:
    - 2.1 Cohesionless and Cohesive Materials: Cohesionless materials include materials classified in MIL-STD-619 as GW, GP, SW, and SP. Cohesive materials include materials classified as GC, SC, ML, CL, MH, and CH
    - 2.2 Degree of Compaction: Degree of compaction required as expressed as a percentage of the maximum density of ASTM D 698.
  - 3.0 EXECUTION:
    - 3.1 Compaction Requirements: Each layer shall be compacted to not less than the percentage of maximum density specified by the design requirements or as previously required.
    - 3.2 Test Procedure: Field in-place density shall be determined in accordance with ASTM 698 (95%).
- END OF SECTION 02231





## SECTION 02240

### SOIL STABILIZATION - CRUSHED ROCK SUBGRADE

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing of materials and the preparation and production of a stabilized subgrade by adding granular material and/or fines to the native subgrade material.
- 2.0 PRODUCT: The crushed rock subgrade shall be a composite mixture of coarse aggregate and fine aggregate. Coarse aggregate shall consist of hard, durable particles or fragments of stone, gravel, or slag, or a combination of these. Materials that break up when alternately frozen and thawed, or when alternately wetted and dried are not suitable for stabilized material. Fine aggregate shall consist of natural or crushed sand. The composite mixture of coarse and fine aggregates should be free from vegetable matter and lumps or balls of clay.
- Aggregate used shall meet the following gradation limits:
- |                                  |          |
|----------------------------------|----------|
| Coarse Aggregate                 |          |
| Retained on 1-1/2 inch sieve     | 0%       |
| Retained on 3/4-inch sieve       | 0-15%    |
| Retained on No. 4 sieve, minimum | 10%      |
| Retained on No. 8 sieve          | 25 - 70% |
| Fine Aggregate                   |          |
| Retained on No. 40 sieve         | 50 - 90% |
| Retained on No. 200 sieve        | 85 - 95% |
- 3.0 EXECUTION: Scarify the subgrade to the depth required. Add granular material to the native material that will bring the composite mixture into compliance with subgrade material requirements. Add water and compact subgrade to required density.

END OF SECTION 02240



## SECTION 02241

### SOIL STABILIZATION - LIME

- 1.0 DESCRIPTION OF WORK: This specification covers furnishing of materials and the preparation and production of a stabilized subgrade by the addition of hydrated lime to the native material.
- 2.0 PRODUCTS: Hydrated lime material requirements shall be as follows:
  - 2.1 Available Lime Index as Calcium Hydroxide: 90 percent minimum.
  - 2.2 Residue retained on No. 30 Sieve: 1 percent maximum.
  - 2.3 Residue retained on No. 200 Sieve: 20 percent maximum.
- 3.0 EXECUTION:
  - 3.1 Preparation: Scarify the subgrade to the depth required and pulverize the material until it is substantially free of lumps greater than three inches in diameter.
  - 3.2 Installation: Lime shall be applied to the pulverized material as a slurry unless otherwise directed. Water shall be added as needed to provide a moisture content of not less than 20 percent. Surface-applied lime slurry shall be plowed and/or disced into the soil as necessary. The resulting mixture shall be aged for not less than 48 hours before compaction.

END OF SECTION 02241



## SECTION 02243

### SOIL STABILIZATION - VIBROFLOTATION

- 1.0 DESCRIPTION OF WORK: This specification covers the densification of sandy subsurfaces by the method of vibroflotation.
- 2.0 PRODUCT: (Section not used.)
- 3.0 EXECUTION: The vibroflotation process shall be applied only to areas of clean, granular soils, with not over 20 percent silt or 10 percent clay. Vibrators shall be water-jetted into the soil mass to the depth required. The vibrator shall be withdrawn in 1 foot increments as the saturated soil compacts laterally and at a rate of approximately 1 ft/min to a minimum relative density of 70 percent. As the surface crater forms, sand or crushed rock shall be added and compacted to the appropriate line and grade. The horizontal distance between successive treatments shall not exceed 5 feet, or as directed.

END OF SECTION 02243



## SECTION 02244

### SOIL STERILIZATION

- 1.0 DESCRIPTION OF WORK: This specification covers soil sterilization. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations.
- 2.0 PRODUCTS:
  - 2.1 Weed Eradication and Soil Fumigation: Products approved by the Environmental Protection Agency.
  - 2.2 Liquid and Dry Herbicides:
    - 2.2.1 Bare Ground Herbicides: Bromacil powder mixture or an ammonium sulfamate spray.
    - 2.2.2 Wetting Agents: As required.
  - 2.3 Equipment: Equipment shall be appropriate to the application and approved before use by the Contracting Officer.
- 3.0 EXECUTION:
  - 3.1 Soil: After the subgrade has been prepared, all areas to be surfaced shall be treated with a weed eradicant and soil fumigant only in the designated areas.
  - 3.2 Wetting Agents may be used as an additive to improve the performance of weed and brush herbicides.

END OF SECTION 02244



## SECTION 02245

### FINISH GRADING FOR STRUCTURES AND SLABS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing of labor and equipment for finish grading for structures and slabs.
- 2.0 PRODUCTS: Borrow material shall be selected to meet requirements and conditions of the particular fill for which it is to be used. Necessary clearing, grubbing, disposal of debris, and satisfactory drainage of borrow pits shall be performed by the Contractor. The source of approved borrow material shall be the Contractor's responsibility.
- 3.0 EXECUTION:
  - 3.1 Topsoil shall be removed without contamination with subsoil and stockpiled convenient to areas for later application or at locations specified.
  - 3.2 Excavation shall be performed to the required lines and grades. Satisfactory excavation material shall be transported to and placed in fill areas within the limits of the work. All unsatisfactory material and surplus material shall be disposed of in areas away from side. Unsatisfactory materials shall include but not be limited to material containing organic, and building debris.
  - 3.3 Fills and Embankments: The completed fill shall meet the requirements of the particular case. Fill shall be satisfactory material. No frozen material will be permitted in the fill. Stones having a dimension greater than 4 inches shall not be permitted in the upper 6 inches of fill or embankment.
  - 3.4 Compaction Requirements: Satisfactory material shall be placed in horizontal layers not exceeding 8 inches in loose depth and compacted to 95 percent maximum density or in conformity with ASTM D 698.

END OF SECTION 02245



## SECTION 02261

### RIPRAP

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of riprap. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
  - 2.1 Riprap: Stone used for dumped riprap shall be hard, durable, angular in shape, resistant to weathering and to water action, and free from overburden, spoil, shale, and organic material. Neither width nor thickness of a single stone should be less than one third its length. Rounded stone, boulders, shale, and stone with shale seams will not be acceptable. The minimum density of the riprap material shall be 162 pounds per cubic foot. Each load of riprap shall be reasonably well graded. Sand and rock dust exceeding 5 percent by weight of each load shall not be permitted.
  - 2.2 Riprap Bedding: The riprap bedding blanket shall consist of well graded gravel, crushed rock, sand, or a combination thereof with a maximum size of 6 inches. All material comprising the riprap bedding blanket shall be composed of tough, durable particles, reasonably free from thin, flat, and elongated pieces, and shall contain no organic matter nor soft, friable particles in excess quantities.
- 3.0 EXECUTION:
  - 3.1 Preparation: Prepare earth slopes by grading and compacting.
  - 3.2 Installation:
    - 3.2.1 Riprap Bedding Blanket Layers shall be placed on the prepared slope or area to develop the full thickness. Each layer shall be placed in one operation, using methods that will not cause segregation of particle sizes within the bedding. The surface of the finished layer should be reasonably even and free from mounds or windows.
    - 3.2.2 Stone for Riprap shall be placed on the prepared slope or area in a manner that will product a reasonably well-graded mass of stone with the minimum practicable percentage of voids. Riprap shall be placed to its full course in one operation and in such a manner as to avoid displacing the underlying material. The larger stones shall be well distributed and the entire mass of stone shall be well-graded. The result shall be a compact, uniform riprap layer.

END OF SECTION 02261



## SECTION 02262

### GABIONS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of gabions. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
  - 2.1 Wire Cages shall be made of hexagonal twist mesh (3 1/2 inches x 4 1/2 inches) with heavily galvanized steel wire. Wire for wire cages shall be a minimum of 0.118 inch in diameter and shall be in conformance with Fed. Spec. QQ-W-461.
  - 2.2 Lacing Wire shall meet the same specifications as the wire used in the mesh, except that its diameter shall be a minimum of 0.0860 inch.
  - 2.3 Fill Material shall consist of hard, durable, clean stone, 4 to 3 inches in size, or as approved.
- 3.0 EXECUTION:
  - 3.1 Preparation: Before gabions are placed, the earth on which the gabions are to be placed shall be graded to be relatively smooth.
  - 3.2 Installation:
    - 3.2.1 Baskets shall be delivered in a collapsed form. Erect and lace together with lacing wire.
    - 3.2.2 Install Fill Rock in mesh baskets with appropriate equipment. Manually adjust stone during the filling operation to prevent undue voids.
    - 3.2.3 Hand Place Exposed Faces using selected stone to prevent gabions from bulging. Level the last lift of stone with the top of the gabion to properly close the lid to provide an even surface for the next course.

END OF SECTION 02262



## SECTION 02263

### SOIL - CEMENT SURFACING

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of soil-cement surfacing. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
  - 2.1 Soil: Use SP and SM soils as classified in ASTM D 2487. The soil aggregate shall contain not more than 55 percent material by dry weight passing the No. 4 sieve and not more than 25 percent material passing the No. 200 sieve. Clay lumps shall be removed.
  - 2.2 Cement: ASTM C 150, Type I.
  - 2.3 Curing Compound: ASTM C 309.
- 3.0 EXECUTION:
  - 3.1 Place the Plant-Mixed Soil-Cement in uniform lifts and compact to the agreed-upon density as determined by ASTM D 558. The optimum moisture content shall be maintained.
  - 3.2 Finish Soil-Cement Surface to the required lines, grades, and cross sections after compaction.
  - 3.3 Construction Joints: If required, construction joints may be horizontal or vertical.
  - 3.4 Curing: Temporary curing of surfaces to receive subsequent bonded lifts or coatings shall be by water fogging. Final curing shall be by application of a membrane maintained intact for 7 days.

END OF SECTION 02263





SECTION 02264  
EROSION CONTROL

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of mesh or netting for erosion control. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
  - 2.1 Jute Mesh: Fed. Spec. CCC-C-467.
  - 2.2 Plastic Mesh: Manufacturer's recommendation.
  - 2.3 Plastic Netting: Manufacturer's recommendation.
  - 2.4 Polypropylene Mesh: Manufacturer's recommendation.
  - 2.5 Woven Fabric Fence: EPA specifications.
  - 2.6 Hay-Bales: EPA specifications.
- 3.0 EXECUTION:
  - 3.1 Preparation: Grade, compact, fertilize, and seed the area to be protected.
  - 3.2 Installation: Apply blankets either horizontally or vertically to the slope. In ditches, apply blanket in direction of water flow. Lap and anchor blankets according to the manufacturer's instructions. Install woven fabric fence and hay bales adjacent to all excavated areas.

END OF SECTION 02264



## SECTION 02300

## PILES

1.0 DESCRIPTION: This specification covers the furnishing and installation of permanent, test, and reaction piles. It also includes, where indicated, the establishment of electrical continuity (1) among piles which become incorporated into the Work and (2) between the piles and the concrete reinforcement in the pile cap.

## 1.01 EQUIPMENT

A. Driving equipment shall be either steam, air, or diesel hammers having a rated energy when final blow count is attained, as follows:

Design Bearing Capacity of Pile	Minimum Rated Energy of Hammer
45 tons	15,000 foot-pounds per blow
60	19,000
100	32,000

B. Vibrators, hydraulic hammers, and hydraulic jacks may be used if accepted by the Contracting Officer; do not use drop hammers. Maintain valve mechanism, and other parts of hammers and hoses, in a condition which will ensure that length of stroke and number of blows per minute, for which hammer is designed, will be realized. Steam and air hammers shall have boiler and air capacity which is not less than that specified by hammer manufacturer; boiler and compressor shall be equipped with an accurate pressure gauge. Diesel hammers shall be equipped with either pressure gauges or other devices calibrated to determine hammer energy.

C. The pile driving machine shall be of the rigid frame type, with the leads forming an integral part of the machine. A swinging hammer or a hammer riding in swing may be used only in connection with a rigid template holding the pile and only after approval by the Contracting Officer. Pile and hammer shall be held in alignment by leads ensuring that centerline of hammer is an extension of centerline of pile. The hammer shall be fitted at its lower end with an anvil base built especially for the type of pile used. It shall hold the pile centrally under the hammer and prevent the pile head from crumpling during the driving operation. A recess shall be provided at the top of the anvil to receive a cushion block at least 12 inches high, of material and construction satisfactory to the Contracting Officer. Followers, if required, shall be slightly smaller than the pile and shall be constructed not to damage pile head. Followers may be used only with approval by the Contracting Officer.

D. If piles are Type A, B, F, or G, driving head shall fit pile top and shall extend down sides of pile not less than four inches.

E. If piles are Type C or D, mandrel shall fit snug inside pile shell and shall extend full length of pile shell; hammers shall have mandrel drivers.

## 1.02 JOB CONDITIONS



## 02000 - Site Work

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- A. Excavation and embankment shall have been completed to pile cap bottom elevation before driving piles.
- B. Fill no pile with concrete until all piles within 15 feet have been driven and have been accepted.
- C. Drive piles within 50 feet of cast-in-place concrete only after concrete has been in place longer than 72 hours.

### 2.0 PRODUCTS

#### 2.01 PILES

- A. Type A piles shall be hot rolled steel conforming to ASTM A36. Dowels shall be deformed steel concrete reinforcement conforming to ASTM 615, Grade 40.
- B. Type B and G piles shall consist of seamless or spiral butt- welded steel pipe conforming to ASTM A252, grade as indicated, having wall not thinner than indicated; concrete of class indicated; and deformed steel concrete reinforcement conforming to ASTM A615, Grade 60. Pipe ends shall be square-cut for driving and bearing surfaces. End closure plates shall be hot rolled steel conforming to ASTM A36. Concrete for filling rejected piles shall be Class 2500.
- C. Type C, D, or F piles shall consist of cylindrical, watertight, steel shells of constant-diameter, corrugated, step-tapered corrugated, or fluted, design and have strength and rigidity to permit installation and prevent distortion caused by soil pressures and by installation of adjacent piles; Class 3000 concrete; deformed steel concrete reinforcement conforming to ASTM A615, Grade 60; and spiral reinforcement conforming to ASTM A82 ( $f_y = 70,000$  psi). End closure plates for Type C and D piles shall be hot rolled steel conforming to ASTM A36. Concrete for filling rejected piles shall be Class 2500. The shell of Type F piles shall be of the gauge indicated.

#### 2.02 BONDING BARS FOR ESTABLISHING ELECTRICAL CONTINUITY AMONG PILES AND BETWEEN PILES AND CONCRETE REINFORCEMENT IN PILE CAP: #4 plain or deformed steel concrete reinforcement conforming to ASTM A615, Grade 40.

#### 2.03 PILE DRIVING TIPS: Associated Pile and Fitting Corp.'s Hard-Bite, or accepted equivalent.

#### 2.04 CONCRETE FOR SOCKETING: Class 3000

#### 2.05 GROUT FOR SOCKETING: 3000 psi. (minimum)

#### 2.06 FILL FOR VOID BETWEEN PILE AND WALL OF DRILLED HOLE: Dry sand or lean concrete.

### 3.0 EXECUTION

#### 3.01 EXAMINATION: Examine piles for damage before driving; remove damaged piles from worksite.

#### 3.02 PRELIMINARY WORK

- A. Field fabrication: Total length of each pile may be built-up in sections either before or during driving operations. Not more than two splices shall occur in any one pile. If pile of Type A, B, or G needs to be spliced, align sections ensuring that pile axis will be straight, and weld webs and flanges or pipe in accordance with AWS D1.1 to develop strength of entire cross- section. If pile is Type B or G, weld field splices using a backup ring with wall thickness equal to the wall thickness of the pile and a width not less than 1/2 the pile diameter. Each splice shall develop 100 percent of the strength of the pile section in compression and bending, and not less than 50



percent of the strength of the pile section in tension. Position splices to occur at least 20 feet from estimated final pile cut-off elevation, except as may be required by Article 3.03C4 of this Section. Pile shall show neither knee nor bend at the splice.

If pile acceptance will be based on calculated final blow count, use pile lengths less than 15 feet longer than estimated pile penetration.

- B. If piles will be installed through new embankment thicker than five feet, drill holes five feet through embankment, or greater depth if directed by the Contracting Officer, into underlying soil. Lower each pile to bottom of drilled hole, and drive pile to final blow count. If pile will be Type A, fill void around pile, for full height of drilled hole, with dry sand or lean concrete within one hour after pile has been driven.

1. If pile will be Type A, hole diameter shall be greater than diagonal dimension of pile.
2. If pile will be Type B, C, or G, hole diameter shall be not less than outside diameter of pile or more than one inch greater than outside diameter of pile.
3. If pile will be Type D or F, hole diameter shall be not less than outside butt diameter of pile or more than one inch greater than outside butt diameter of pile.

3.03 INSTALLATION: Driving sequence shall ensure that no pile will be driven immediately adjacent to more than two previously driven piles.

- A. If stickup will be less than 15 feet, calculate the value of S (average final set, in inches per blow, during last six inches of penetration) by one of the following formulas. The formulas require no conversion factors when specified numerical values are used therein.

1. If pile will be Type A, C, or D, average final set shall be determined by the formula:

$$S = \frac{4.8e E (Wr + n^2 Wp) - C1 + C2 + C3}{P(Wr + Wp) \quad 2}$$

Where

S = Average final set, in inches per blow, during last six inches of penetration.

e = Efficiency of hammer. Default value (in the absence of basis or field experience for a different value) shall be 0.85, but efficiency value in formula shall never exceed 0.93.

Wr = Weight of ram, in pounds.

Wp = If pile will be Type A, sum of pile and driving cap weights, in pounds. If pile will be Type C or D, sum of mandrel, driving cap, and shell weights, in pounds.

E = Energy in foot-pounds.

- A. For steam and compressed air hammers; equals hammer manufacturer's rated energy per blow where  $E = 12WrH$ , where H = Stroke of ram, in inches.

- B. For single acting diesel hammer;  $16.05 (60)^2 Wr$ , where  $(2t)^2$



## 02000 - Site Work

default value of  $t$  shall be 42, but when there is field experience,  $t$  = actual blows per minute at final set.

- C. For double acting diesel hammers: energy corresponding to measured output gage reading of bounce chamber, as published by hammer manufacturer.

$n$  = Coefficient of restitution. Default value shall be 0.50.

C1= Temporary compression allowance for pile head and cap, in inches. Default value shall be 0.34.

C2= Temporary compression allowance for pile, in inches. If pile will be Type C or D, default value shall be  $0.0080L$ , where  $L$  = total length of pile before cut-off, in feet. If pile will be Type A, default value shall be  $eEL$ ,

$$50,000 Ws$$

where  $L$  = total length of pile before cut-off, in feet, and  $Ws$  = weight of pile in pounds per linear foot.

C3= Temporary compression allowance for ground, in inches. Default value shall be 0.10.

$P$  = Design bearing capacity of pile, in pounds.

2. If pile will be Type B, F, or G, average final set shall be determined by the formula:

$$S = 3Ee - 0.15$$

$$2P$$

Where terms are the same as noted in Article 3.03A1.

- B. Calculate the value of  $N$ , which is equal to  $12/S$ .

- C. Drive pile without interruption until (1) blow count per foot increases to the value of  $N$ ; (2) blow count per foot increases to value greater than  $N$  as may be determined by the Contracting Officer based on the results of load testing; (3) sufficient penetration to develop the pile's uplift capacity has been achieved; or (4) the penetration which, in the Contracting Officer's judgment, is warranted by the pile driving records submitted, has been achieved. If pile-driving has been interrupted before the value of  $N$  has been attained, drive pile not less than another foot before counting final blows.

1. If a pile penetrates more than five feet deeper than piles previously installed in a pile cap, redrive short piles until the value of  $N$  becomes double the value calculated in Article 3.03B.
2. If the value of  $N$  is attained when pile tip elevation is more than five feet above pile tip elevation of adjacent driven piles, drive pile until the value becomes double the value calculated in Article 3.03B.
3. Unless there is evidence that pile tips are resting on a dipping rock stratum, Authority may require that short piles be driven farther so that the maximum difference in tip elevations of piles in any one pile cap, or within 30 feet, will be 10 feet.



4. If pile butt becomes deformed before the value of  $N$  becomes equal to  $12/S$ , cut off damaged portion of butt and, if necessary, splice pile before driving pile to value of  $N$ .
5. If a pile cannot be driven through a hard stratum covering soft stratum, remove pile, drill to the top of the hard stratum, drill through hard stratum, lower or drive pile to bottom of drilled hole, and drive pile until the value of  $N$  has been attained. Diameter of hole drilled through hard stratum shall not be greater than 95 percent of the greatest dimension of pile cross-section at depth of stratum. If pile is Type A, fill void around pile with dry sand or lean concrete within one hour after pile has been driven. If pile is Type B, C, D, F, or G and diameter of hole through overburden exceeds diameter of pile, fill void around pile with dry sand or lean concrete within one hour after pile has been driven.
6. If a driven pile has been raised by driving other piles, redrive raised pile until the value of  $N$  has been attained.
7. If pile is being damaged during driving or if pile cannot be driven without having a pile driving tip, the Contracting Officer may direct that tips be installed on each pile to be driven for that group.
8. If pile is not indicated to be subject to uplift, drive 45- or 60-ton pile to not less than 12 feet below bottom of footing, and drive 100-ton pile to not less than 15 feet below bottom of footing, even though the value of  $N$  may have been attained at a lesser penetration. If these pile penetrations cannot be obtained by driving, remove pile, drill through overburden from the ground surface to the top of the rock, and drill a socket into the rock to depth determined by Authority for developing indicated lateral capacity of pile, but not less than three feet.
  - a. Drill rock socket.
    - (1) For Type A pile, hole diameter shall be greater than diagonal dimension of pile.
    - (2) For Type B, C, or G pile, hole diameter shall be between one and two inches greater than outside diameter of pile.
    - (3) For Type D or F pile, hole diameter shall be between one and two inches greater than pile diameter measured three feet from tip.
  - b. Center pile in socket, and fill void between pile and walls of socket.
    - (1) If pile is Type A, fill void with concrete.
    - (2) If pile is Type B, C, D, F, or G, fill void with grout.
  - c. Fill void around pile, for full height of drilled hole above rock, with dry sand or lean concrete. Consolidate sand with power vibrators. Ensure that pile will not be displaced while compacting sand.
9. For pile indicated to be subject to uplift, drive until embedment length in undisturbed soil is not less than 25 feet even though the blow count per foot may have increased to the value of  $N$  at a lesser embedment. Portions of pile in a drilled hole shall not be considered in determining embedded length. If 25-foot embedment length cannot be obtained by driving, the Contracting Officer will direct the Contractor to either (1) remove pile, drill through overburden from the ground surface to the top of rock, and drill a socket into the



## 02000 - Site Work

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rock to depth determined by the Contracting Officer to reach indicated uplift capacity, but not less than three feet, or (2) install anchors into rock, and drive additional piles as necessary to resist the load of anchor prestressing.

- a. If Authority directs that pile be socketed into rock, socket as specified in Articles 3.03C8a, 3.03C8b, and 3.03C8c of this Section.
  - b. If Authority directs that rock anchors be installed, he will determine positions and configuration of anchors and sizes of anchor tendons. Install rock anchors as directed by the Contracting Officer and as specified in Article 3.03D of this Section.
10. If pile is Type B, C, D, F, or G and driven pipe or shell contains more than two inches of water, bail water until not more than two inches of water exists in pipe or shell. Place concrete reinforcement and concrete. Vibrate only upper 15 feet of concrete in pile.
- D. Install rock anchors. Test each anchor using a load cell to measure test loads:
1. Load the first anchor in pile cap, in increments of 15 percent of design load, to 150 percent of design load. Hold each load increment constant for one hour, and record tendon elongation at 1, 2, 4, 6, 10, 20, 40, and 60 minutes. Hold the 150-percent load nine additional hours, and record tendon elongation every hour.
  2. Load the remaining anchors in pile cap, in increments of 25 percent of design load, to 150 percent of design load. Hold each load increment constant for 10 minutes, and record tendon elongation at 1, 2, 4, 6, and 10 minutes. Hold the 150-percent load for a total of one hour, and record tendon elongation at 20, 40, and 60 minutes.
  3. An anchor will be accepted only if three conditions are satisfied:
    - a. The actual tendon elongation is more than 80 percent of the theoretical free length elongation for every test load. The theoretical free length elongation shall be taken as  $PL/AE$  where:  
 $P$  = applied test load, in pounds  
 $L$  = distance from jack to bottom of free length specified, in inches  
 $A$  = cross section area of steel tendon, in square inches  
 $E$  = Young's modulus of steel, in psi
    - b. The total tendon elongation, measured at the maximum test load, does not exceed the theoretical elongation of a tendon length measured from the jack to the midpoint of the bond length.
    - c. The creep movement does not exceed 0.00011 times the free stressing length for the final logarithmic cycle of time the anchor is loaded.
  4. Lock off anchors at 100 percent of design load.
- E. Cut off piles in a horizontal plane at indicated cut-off elevation. Cut off portions of piles shall remain the property of the Contractor. Remove from the worksite those portions which will not be used as other piles or for pile splicing.
- F. Establish electrical continuity, where indicated, among piles and between piles and concrete reinforcement in pile cap.



1. For Type A piles not subject to uplift, weld four bars to each pile butt. Detail shall be the same as shown on Drawing GS151 or RS188 for uplift dowels except that bar size shall be #4.
2. For all pile types, bonding bars shall interconnect (1) all bars extending from the butts of all piles in the pile group and (2) the concrete reinforcement in the pile cap. Weld bonding bars to both bars extending from pile butts and to concrete reinforcement in pile cap; welding shall conform to AWS D1.1.

G. Tolerances

1. Plan location at top: six inches.
2. Center of gravity of a pile group: four inches.
3. Plumbness: two degrees, or 0.035. Plumbness of Type A piles shall be measured at the stickup portion of pile. Plumbness of Type B, C, D, F, or G piles shall be measured by a plumb line inside the pipe or shell.
4. Batter: four degrees, or 0.070. Batter shall be measured at the stickup portion of pile.
5. If pile is Type B, C, D, F, or G, at least one-half of pile bottom shall be visible when pile bottom is viewed from cut-off elevation.

3.04 REMEDIAL WORK

- A. If center of gravity of a pile group deviates more than four inches from design position, drive additional pile or piles as determined by Authority to realign design position of the center of gravity.
- B. If a pile has been driven outside indicated limits of pile group, enlarge pile cap to a size determined by Authority.
- C. If piles will be Type F and have been driven below cutoff elevation, either lower bottom elevation of pile cap to satisfy design embedment of pile top or extend pile section to cut elevation. Embed dowels for electrolytic protection into pile not less than two feet after pile has been cut.

3.05 REJECTED PILES: A pile showing distinct signs of buckling or is eccentric from a straight line connecting the centers of the ends of the pile by more than 1/20 of pile length will be rejected. A pile which has a diameter less than 95 percent of nominal diameter or a cross sectional area less than 90 percent of nominal area will be rejected. Rejected piles shall be removed or abandoned in place. If abandoned in place, cut off not less than two feet below pile cap bottom elevation. Abandoned Type B, C, D, F, or G piles shall be filled with concrete. Rejected piles shall be replaced with acceptable piles.

3.06 FIELD QUALITY CONTROL

- A. Inspect piles for damage after driving. Inspect piles of Type B, C, D, F, or G, for collapse, tears, splits, and reduced diameter throughout their length immediately before reinforcement and concrete are placed. Furnish adequate lighting for pile inspection.
- B. Inspect welding as required by the Contracting Officer.

END OF SECTION 02300





## SECTION 02400

### SHEET PILING, SHORING, UNDERPINNING

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing of materials and labor for Sheet Piling, Shoring, and Underpinning for the protection of existing buildings, streets, walkways, utilities, and other improvements and excavations against loss of ground or caving embankments; Maintenance of shoring and bracing; Removal of shoring and bracing, as required.
- 1.1 Submittals: Provide layout drawings for shoring and bracing systems and other data or computations prepared and sealed by a registered Professional Engineer licensed in the State of Texas. The system design and calculations must be acceptable to the Contracting Officer.
- 2.0 PRODUCTS: Provide suitable shoring and bracing materials which will support loads imposed. Materials need not be new, but shall be in serviceable condition.
- When wood is part of shoring system that will remain in place after placement of backfill, pressure preservative treated materials must be used.
- 3.0 EXECUTION: 3.1
- 3.1 Before starting work check and verify governing dimensions and elevations.
- 3.1.1 Survey conditions of adjoining properties. Take photographs to record any prior settlement or cracking of structures, pavements, and other improvements. Prepare a list of such damages, verified by dated photographs, and signed by contractor and the Contracting Officer.
- 3.1.2 Sheet Piling, Shoring and Underpinning for the Protection of excavations and protection of adjacent structures shall conform to the requirements of the following:
- 3.1.2.1 Underpinning: C26 - 1110.0.
- 3.1.2.2 Construction required for or affecting the support of adjacent properties or buildings: C26 - 1112.6.
- 3.1.2.4 Excavation Operations: C26 - 1903.0.
- 3.2 Shoring:
- 3.2.1 Wherever shoring is required, locate the system to clear permanent construction and to permit forming and finishing of concrete surfaces.
- 3.2.2 Provide shoring systems adequately anchored and braced to resist earth and hydrostatic pressures.
- 3.2.3 Shoring systems retaining earth on which the support or stability of existing structures is dependent must be left in place at completion of work.
- 3.3 Bracing:
- 3.3.1 Locate bracing to clear columns, floor framing construction, and other permanent work. If it becomes necessary to move a brace, install new bracing prior to removal of original brace.



- 3.3.2 Do not place bracing where it will be cast into or be included in permanent concrete work, except as otherwise acceptable to the Contracting Officer.
- 3.3.3. Install internal bracing, if required to prevent spreading or distortion to braced frames.
- 3.3.4 Maintain bracing until structural elements are rebraced by other bracing or until permanent construction is able to withstand lateral earth and hydrostatic pressures.
- 3.4 Removing:
  - 3.4.1 Remove sheeting, shoring and bracing in storages to avoid disturbance to underlying soils and damage to structures, pavements, facilities, and utilities.
  - 3.4.2 Repair or replace, as acceptable to the Contracting Officer, adjacent work damaged or displaced through installation or removal of shoring and bracing work.

END OF SECTION 02400



## SECTION 02440

### IRRIGATION SYSTEM

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of irrigation systems. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

#### 1.01 SUBMITTALS

- A. Submit properly identified Manufacturer's literature before commencing work.
  - 1. Submit shop drawings on the following:
    - a. Pipe and Fittings.
    - b. Sprinkler Heads.
    - c. Pump.
    - d. Gate Valve.
    - e. Electric Control Valve.
    - f. Pressure Gage.
    - g. Controller.
    - h. Foot Valve.
    - i. Compound Gage.
    - j. Pressure Switch.
    - k. Vacuum Brakes.
    - l. Valve Boxes.
    - m. Pressure Relief Valve.
    - n. Hydropneumatic Tank.
- B. Record Drawings: Indicate layout of sprinkler heads, controls, and piping on "Record Drawings" complete with location and dimensions.

#### 2.0 PRODUCTS

##### 2.01 PIPE AND FITTINGS

- A. Underground Piping: Polyvinylchloride (PVC) ASTM D1785-76, Type 1, Grade 1.
  - 1. Solvent Welded: Schedule 40.
  - 2. Threaded: Schedule 80, cut with clean, sharp dies having a negative rake, for swing joint risers, only. a. Use silicone, water or standard thread cutting oil.
  - 3. Pump Suction Piping: PVC Schedule 80.
  - 4. Piping to 10 feet - off the pump: Schedule 40 galvanized steel ASTM A120-83 galvanized malleable iron fittings.



- B. Swing Joint Riser Pipe: Polyvinylchloride PVC ASTM D1785-76, Type 1, Grade 1, Schedule 80.
- C. Pipe Sleeves: Schedule 40 galvanized steel pipe providing minimum 1/2" clearance between sleeve and PVC sprinkler pipe.
- 2.02 SOLVENT CEMENT
  - A. In accordance with ASTM D2564-80.
- 2.03 SPRINKLER HEADS
  - A. Provide sprinkler heads as follows:
    - 1. Toro 570 or accepted equivalent
    - 2. Toro 600 or accepted equivalent
    - 3. Toro 700 or accepted equivalent
    - 4. Toro 640 or accepted equivalent
  - B. Paint above grade risers for stationary head with two coats of exterior flat black paint unless already black painted by manufacturer.
- 2.04 GATE VALVE
  - A. Nibco Model T-III, all bronze body, Class A, Type II, or accepted equivalent.
- 2.05 CONTROL VALVE BOX
  - A. C. R. Nelson Corp., VB-12 with VB12E extension and cover marked "Irrigation Control Valve", or accepted equivalent.
- 2.06 PUMPS
  - A. Self-priming centrifugal end suction type with capacitor start motor designed for continuous operation and with ball bearings and steel shaft as manufactured by Sta-Rite or accepted equivalent.
    - 1. Furnish starter with pump.
    - 2. Base and diffuser shall be cast iron with bronze impeller.
- 2.07 ELECTRIC ZONE CONTROL VALVE
  - A. Brass body rated at 200 psi with flow control and manual shut-off. 1. Non corrosive piston and cylinder assembly, 24 volts AC solenoid.
- 2.08 CONTROLLER
  - A. 7 day, 24 hour, 110 volts, 60 Hz AC with 24 volts output, number of stations as required for system (RainBird or accepted equivalent).
    - 1. Provide complete with internal transformer
    - 2. Provide pump switch control circuit.
- 2.09 PRESSURE RELIEF VALVE
  - A. Watts No. 53L, or accepted equivalent.



## 02000 - Site Work

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### 2.10 PRESSURE GAUGE

- A. 4-1/2 inch diameter drawn steel case, 0-100 psi range, Marshalltown No. 23, or accepted equivalent. 1. Provide gage cock.

### 2.11 FOOT VALVE: Flomatic Model 60-5, bronze body, or accepted equivalent. Valve shall be 4 inch size.

### 2.12 COMPOUND GAGE: 4-1/2 inch steel case, Marshalltown Model 45, or equivalent. Provide gage cock.

### 2.13 PRESSURE SWITCH: Mercoid Series "D", with visible calibrated dial.

### 2.14 VACUUM BREAKER: Conform to local authority requirements.

### 2.15 HYDROPNEUMATIC TANK: As necessary for system and approved by the Contracting Officer.

### 2.16 WELL

- A. 6 inch nominal diameter, standard weight galvanized steel drive pipe with butt welded joints.

## 3.0 EXECUTION

### 3.01 INSPECTION

- A. Do not proceed with the work of this section until conditions detrimental to the proper and timely completion of the work have been corrected in an acceptable manner.

### 3.02 EXCAVATION, PLACING PIPING AND BACKFILLING

- A. Excavate trenches for underground piping to provide a minimum of 24 inches cover under pavement without pipe sleeve or 12 inches cover with pipe sleeve and a minimum of 12 inches cover in landscaped areas. 1. After pipe has been installed and tested, cover with three inches of rock-free soil and backfill trenches to grade. a. Backfill shall be tamped in place. b. Remove from the site, materials not suitable or required for backfill.

- B. Coordinate underground piping location with new trees location to avoid interference.

### 3.03 SWING JOINTS

- A. Install sprinkler heads on the swing joints.

### 3.04 SOLVENT CEMENTED JOINTS IN PVC PIPE AND FITTINGS

### 3.05 THREADED JOINTS IN PVC PIPE AND FITTINGS

- A. Use Teflon thread tape or liquid Teflon thread lubricant.
- B. Do not use pipe wrenches or pump pliers on PVC pipe or fittings.

### 3.06 SPRINKLER HEADS

- A. Install flush with the finished grade unless otherwise directed by the Contracting Officer.

### 3.07 WELL

- A. Case the well through sand and seat in rock.
- B. Develop the well by pumping continuously at the rate of 240 GPM minimum or until the water is free of sand.



C. Well Depth: Minimum 50 feet.

3.08 CLEANING, TESTING AND BALANCING

A. Before testing, thoroughly flush piping system until clean.

B. Do not cover piping system with backfill until tests are satisfactorily performed.

C. Hydrostatically test the piping system at 100 psi for one hour with no loss in pressure. 1. Test the piping system with plugs at swing joint and branch tee locations. 2. Install swing joints after hydrostatic testing is satisfactorily performed.

D. Notify the Contracting Officer 24 hours in advance of any test and obtain acceptance of tests from the Contracting Officer before covering piping.

E. Provide pattern, throw and delivery to uniformly cover irrigated area.

F. Adjust and balance the components of the piping system to provide complete coverage with a minimum of overthrow.

END OF SECTION 02440



## SECTION 02450

### PIPE SLEEVES FOR UTILITY LINES

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of pipe sleeves for utility lines. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
  - 2.1 Jack-Boring Operation; AREA Manuals 1-4.
  - 2.2 Sleeve Materials:
    - 2.2.1 Concrete Pipe: ASTM C 300
    - 2.2.2 Steel Pipe: ASIM C 200
    - 2.2.3 Corrugated Steel Pipe: ASTM A 760
    - 2.2.4 Ductile Iron Pipe: ASTM A 716
- 3.0 EXECUTION:
  - 3.1 Structures: Where utility lines are required to be installed within 3 feet of existing buildings or structural foundations, the lines shall be encased in sleeves of rigid conduit.
  - 3.2 Clearance: A minimum clearance of at least 2 inches between the inner diameter of the sleeve and the maximum outside diameter of the sleeved pipe, including the joints, shall be provided.
  - 3.3 Sand Bedding: Sand bedding shall be provided for the carrier. Pipe through the sleeve.
  - 3.4. All sleeves installed below ground shall be watertight.

END OF SECTION 02450



## SECTION 02467

### PIPE LINING

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of pipe lining. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
  - 2.1 Lining Material:
    - 2.1.1 Polyethylene Pipe: Extruded, flexible industrial grade, high density (Type 3 or 4) in 40 foot lengths, complying with ASTM D 2239 and D 2447.
      - 2.1.1.1 Diameter: Outside diameter shall be as large as possible while allowing for ease of pulling into the existing pipes. Pipe dimensions shall comply with ASTM D 2447 and D 2837.
      - 2.1.1.2 Liner Thickness and Class shall be suitable for the use intended. The tolerance on the pipe wall thickness shall be as noted in Table 2 of ASTM D 2447.
      - 2.1.1.3 Gravity Sanitary, Gravity Storm, and Gravity Industrial Sewers shall be Schedule 40.
      - 2.1.1.4 Gravity Thermal Discharge Sewers shall be Schedule 80.
      - 2.1.1.5 Low Pressure Sewers shall be Schedule 40, complying with ASTM D 2239.
      - 2.1.1.6 High Pressure Sewers shall be Schedule 80, complying with ASTM D 2239 and D 2837.
      - 2.1.1.7 Chemical Resistance: Pipe liner shall be resistant to chemical attack, erosion, and corrosion.
      - 2.1.1.8 Fittings shall be fabricated from polyethylene pipe. The polyethylene fittings shall have the same pressure rating as the pipe and shall comply with ASTM D 3261.
    - 2.1.2 Cement-Mortar Lining:
      - 2.1.2.1 Portland Cement shall comply with ASTM C 150, Type 1.
      - 2.1.2.2 Pozzolan Cement shall comply with ASTM C 618 and shall not comprise more than 20 percent of total cement amount, by weight.
      - 2.1.2.3 Sand shall be well graded, clean, free from organic and extraneous matter. One hundred percent shall pass the 16-mesh size screen.
      - 2.1.2.4 Lining Thickness: Cement lining shall be not less than 1/8 inch for pipe sizes 4 to 14 inches, not less than 3/16 inch for pipe sized 16 inches and larger, and not less than 1/4 inch for steel pipe 16 inches and larger.
    - 2.1.3 Reinforced Mortar Pipe Slip-Lining:





## 02000 - Site Work

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- 2.1.3.1 Gravity Sewers: Slip-lining shall be of glass fiber reinforced polyester mortar pipe, complying with ASTM D 3262.
- 2.1.3.2 Pressure Sewers (Force Mains): Slip-lining shall be of glass fiber reinforced polyester mortar pipe complying with ASTM D 2517.
- 2.1.3.3 Diameter: Outside diameter shall be as large as possible while allowing for ease of pulling into existing pipes, as recommended by the manufacturer.
- 2.1.3.4 Chemical Resistance: Pipe liner shall be resistant to chemical attack, erosion, and corrosion.
- 2.1.3. Fittings: Fittings Shall be manufactured of the same materials as is the glass fiber reinforced polyester mortar pipe.
- 2.1.4 Epoxy-Mortar Lining:
  - 2.1.4.1 Epoxy Compound shall comply with ASTM D 1763.
  - 2.1.4.2 Admixtures shall be well graded with one hundred percent passing. The 16-mesh size screen. All admixtures shall improve the workability, density, and strength of the mortar.
  - 2.1.4.3 Lining Thickness: For pipe sizes 4 to 14 inches, epoxy mortar lining thickness shall be not less than 1/8 inch. For pipe sizes 16 inches and larger, epoxy mortar lining shall be not less than 3/16 inch.
- 2.2 Joint:
  - 2.2.1 Slip-Lining:
    - 2.2.1.1 Polyethylene Pipe Butt Joints: Pipe lengths, fittings, and flanged connections to be joined by thermal butt fusion shall be of the same time, grade, and class of polyethylene compound and supplied by pipe supplier.
    - 2.2.1.2 Flanged Joints shall consist of a polyethylene flange, thermally butt fused to the ends of the pipe. The companion flange shall be steel or cast iron and nylon-coated.
    - 2.2.1.3 Lateral Service Connections: Sidewall connections shall be made with polyethylene pipe sections of the same material, grade, and class as the liner material and shall have the same pressure ratings. Lateral connections shall be watertight.
  - 2.2.2 Reinforced Mortar Lining:
    - 2.2.2.1 Bell and spigot joints shall be the inverted type.
    - 2.2.2.2 Manhole Joints and Connections shall be oakum ring and grout as required.
- 3.0 EXECUTION:
  - 3.1 Slip-Lining, Polyethylene Pipe:
    - 3.1.1 Insertion of Liner: Liner shall be laid at a constant line and grade as the existing pipe, without undulations or damage. Where the existing pipe is not at constant grade, the liner shall follow as true a constant grade as possible.
    - 3.1.2 Grouting: At manholes, annular space shall be packed with oakum and expansion grout or nonshrink grout as required. At existing line, after liner has been inserted, grout wherever existing pipe has failed structurally.



- 3.1.3 Concrete Encasement: Crown of liner shall be encased in concrete a minimum thickness of 6 inches for the entire length of the excavated trench and out at least 6 inches each side of the bottom half of the original pipe remaining down to firm soil. Wherever existing concrete encasement has been removed, the liner shall be encased in the same manner as the original pipe.
- 3.1.4 Thrust Blocks: Concrete thrust blocks shall be provided as required.
- 3.2 Cement Mortar and Epoxy Mortar Lining:
  - 3.2.1 Cement Mortar Mixing: One part cement to one and one-half parts of sand by volume.
  - 3.2.2 Application of Lining: The lining shall be applied to produce a smooth, uniform thickness throughout the interior of the pipe line.
  - 3.2.3 Curing of the Cement Mortar Lining: Immediately upon completion of the lining of a length of pipe between access openings or at the end of a day's run, the section of pipe shall be closed at each end, the access openings covered to prevent the circulation of air, and the atmosphere kept moist.
  - 3.2.4 Reconnection of Pipes After Lining: Close and make watertight all openings in the lines.
  - 3.2.5 Pressure Test and Leaks: Hydrostatic and leakage tests shall be conducted on all pipe that is cleaned and lined.
- 3.3 Reinforced Mortar Pipe Lining:
  - 3.3.1 Joining of Pipe Ends: Liner sections containing bell and spigot joints shall be joined using an O-ring.
  - 3.3.2 Grouting Work shall be accomplished following the same techniques as described in paragraph Slip-Lining, Polyethylene Pipe.
- 3.4 Cement Mortar Lining:
  - 3.4.1 Epoxy Mortar Lining: Excessive mortar shall be removed from the manhole walls and bottom. Manhole bottom shall receive special care in making all transitions smooth.
  - 3.4.2 Work at Service Connections: Plugs or caps shall be placed at the access point of the service connection to the lines and shall be removed once the mortar has set. The completed lining shall not be damaged.
- 3.5 Reinforced Mortar Pipe Lining: Joining of fiberglass reinforced polyester mortar pipe shall be carried out in the trench, with the first section of liner already inserted.
- 3.6 Lateral Connections: Service to connections shall be provided for and continued after installation of the lining.
- 3.7 Testing: Upon completion of lining operation, the sewer line shall be tested for proper operation and shall be observed for a period of 24 hours. All deficiencies shall be corrected.
- 3.8 Pavement Restoration: All disturbed pavement shall be restored to its original condition and shall match existing adjacent.
- 3.9 Inspection: Large diameter sewers shall be inspected from inside to ensure that all lateral connections and joints are in proper order. Sewers that have been cement-lined may be inspected for a smooth finish, while plugs and caps are being removed.

END OF SECTION 02563



## SECTION 02511

### FOUNDATION DRAINAGE SYSTEMS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of foundation drainage systems. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
- 2.1 Clay Pipe: ASTM C 700.
- 2.2 Perforated Clay Pipe: ASTM C 700.
- 2.3 Concrete Pipe: ASTM C 14.
- 2.4 Perforated Concrete Pipe: ASTM C 14 with perforations conforming to ASTM C 444.
- 2.5 Porous Concrete Pipe: ASTM C 654.
- 2.6 Clay Drain Tile: ASTM C 4.
- 2.7 Perforated Clay Drain Tile: ASTM C 498.
- 2.8 Concrete Drain Tile: ASTM C 412.
- 2.9 Cast-Iron Soil Pipe: ASTM A 74.
- 2.10 Perforated Corrugated Steel Pipe: Applicable ASTM Standard.
- 2.11 Fittings: Fittings shall be of compatible materials for pipe.
- 2.12 Cleanouts: Cleanout pipe and fittings and piping through walls and footings shall be cast-iron soil pipe. Each cleanout shall have a brass ferrule and cast-brass, screw-jointed plug with socket or raised head for wrench.
- 2.13 Cover and Wrapping Materials for Open Joints in Drain Tile: Tar paper, roofing paper, reinforced building paper, glass fiber fabric, or other similar type material. Wrapping material shall be 18 x 14 mesh, 0.01-inch diameter nonferrous wire cloth.
- 3.0 EXECUTION:
- 3.1 Trenches shall be kept dry during installation of drainage system. Changes in direction of drain lines shall be made with 1/8 bends. Wye fittings shall be used at intersections.
- 3.2 Bedding: Graded bedding, minimum 6 inches in depth, shall be placed in the bottom of trench for its full width and length. Except for recesses for bell joints, the bedding shall fully support the lower quadrant of the pipe. Material shall be nominal 1/4" size, 90% passing 3/8" sieve and 100% retained on a # 35 sieve. An approved geotextile material shall be placed on the subgrade.



- 3.3 Pipe Laying: Drain lines shall be laid to true grades and alignment with a continuous fall in the direction of flow. Bells of pipe sections shall face upgrade. Perforated pipe shall be laid with perforations facing down.
- 3.4 Joints:
- 3.4.1 Perforated and Porous Types of Drain Pipes shall be laid with closed joints.
- 3.4.2 Non-Perforated and Plain-End Drain Tile shall be laid with 1/8-inch to 1/4-inch open joints. Open joints shall be covered or, wrapped.
- 3.4.3 Joints of Concrete or Clay Sewer Pipe shall be caulked with oakum and filled solid with cement mortar.
- 3.4.4 Joints of Cast-Iron Pipe or connections between cast-iron and porous concrete pipes shall be caulked with oakum gasket and filled with lead.
- 3.4.5 Plain-End Perforated Clay Drain Tile Joints shall be made with spring-wire clips, coated with a rust preventive that will maintain a taut but elastic joint between sections when laid.
- 3.5 Outlet Lines: The outlet end of drain lines connecting with an open gutter or outfall shall be covered with a removable wire basket of copper or bronze wire cloth.
- 3.6 Backfilling: After joints and connections have been inspected and approved, pervious backfill material shall be placed on each side of the pipe or tile and 12 inches above the top of the pipe for the full width of the trench. A protective covering shall be placed over the previous backfill for the full width of the trench before regular backfill is placed. All other backfill material shall be approved prior to installation.
- 3.7 Cleanouts in Unpaved Areas shall be set in 12-inch by 12-inch by 4-inch concrete blocks.

END OF SECTION 02511



## SECTION 02512

### UNDERSLAB DRAINAGE

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of underslab drainage. products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work
- 2.0 PRODUCTS:
- 2.1 Concrete Pipe shall conform to ASTM C 14.
- 2.2 Clay Pipe shall conform to ASTM C 700.
- 2.3 Perforated Clay Pipe shall conform to ASTM C 700. Clips for plain-end pipe shall be constructed of not smaller than No. 9 hard-drawn or oil-tempered steel wire conforming to ASTM C 227 or A 229, and shall be coated with an approved rust preventive coating.
- 2.4 Perforated Concrete Pipe shall conform to ASTM C 444 and to ASTM C 14.
- 2.5 Perforated Corrugated Steel Pipe shall conform to Fed. Spec. WW-P-405.
- 2.6 Perforated Corrugated Steel Pipe, Fully Bituminous-Coated shall conform to Fed. Spec. WW-P-405.
- 2.7 Drain Tile: Clay drain tile shall conform to ASTM C 4. Concrete drain tile shall conform to ASTM C 412.
- 2.8 Porous Concrete Pipe shall conform to ASTM C 654.
- 2.9 Precoated Corrugated Steel Pipe shall conform to Fed. Spec. WW-P-405.
- 2.10 Filter Fabric shall be a previous sheet of polyester, nylon, or polypropylene filaments woven or otherwise formed into a uniform pattern with distinct and measurable openings. The fabric shall be constructed so that the filaments will retain their relative position with respect to each other.
- 2.11 Drainage Structures: Concrete shall have a minimum strength of 3,200 psi and an air content of 4 to 7 percent. Concrete cover over reinforcing shall be in conformance with ACI 318. Expansion joint filler material shall conform to ASTM D 1751 or D 1752. Mortar shall be composed. by volume of one part Portland Cement and two parts sand.
- 2.12 Precast Reinforced Concrete Manhole Risers and Tops shall conform to ASTM C 478.
- 2.13 Precast Concrete Segmental Blocks shall conform to ASTM C 139.
- 2.14 Precast Concrete Manhole Bases shall conform to ASTM C 478.
- 2.15. Brick shall conform to ASTM C 62 or ASTM C 55.
- 2.16 Prefabricated Corrugated Metal: Steel manholes and risers shall be fabricated of galvanized and bituminous coated corrugated metal.



- 2.17 Frames and Covers or Gratings shall be of either cast iron or steel manufactured by an approved foundry shop. Malleable iron frames and covers shall conform to ASTM A 47.
- 2.18 Ladders or Ladder Rungs shall be fabricated of cast iron, wrought iron or galvanized steel.
- 2.19 Subdrain Filter and Bedding Material shall be washed sand, sand and gravel, crushed stone, crushed stone screenings, or slag composed of hard, tough, durable particles free from adherent, coatings. Material shall be nominal 1/4" size, 90% passing a 3/8" sieve and 100% retained on a # 35 sieve. An approved geotextile material shall be placed on the subgrade.
- 3.0 EXECUTION:
- 3.1 Manholes shall be installed complete with frames, ladders, and covers or gratings.
- 3.2 Filter Fabric: One layer of filter fabric shall be wrapped around open joints and perforated or slotted collector pipes. Trenches to be lined with filter fabric shall be graded to obtain smooth side and bottom surfaces so that the fabric will not bridge cavities in the soil or be damaged by projecting rock.
- 3.3 Pipelaying: The laying of pipe shall proceed upgrade beginning at the lower end of the pipeline. Pipe shall not be laid in water. Pipe shall be bedded to the established gradeline. Perforations shall be centered on the bottom of the pipe.
- 3.4 Jointing:
- 3.4.1 Nonperforated Concrete and Clay Pipe: Pipe shall be laid with 1/8- to 1/4-inch openings between ends of pipe.
- 3.4.2 Perforated Concrete and Clay Pipe: Pipe shall be laid with closed joints. Plain-end perforated clay pipe sections shall be fastened together with spring wire clips furnished by the pipe manufacturer.
- 3.4.3 Perforated Corrugated Metal Pipe, or Unpaved Bituminous-coated, Perforated Corrugated Metal Pipe: The sections of pipe shall be securely fastened together with standard connecting bands furnished by the manufacturer of the pipe.
- 3.4.4 Drain Tile: Drain tile shall be laid with open joints of approximately 1/8-inch width but not over 1/4-inch width.
- 3.4.5 Porous Concrete Pipe: Pipe shall be installed with mortar joints.
- 3.4.6 Bituminous-Coated or Uncoated Semicircular Steel Pipe: Coupling bands shall consist of uncorrugated top and bottom sections bolted together with four bolts.
- 3.5 BACKFILLING: Pervious backfill material shall be nominal 1/4" size, 90 % passing a 3/8: sieve and 100% retained on a #35 sieve and placed to a minimum depth of 12" over the pipe and full width of the trench. An approved material shall be used to backfill the remainder of the trench.

END OF SECTION 02512



## SECTION 02520a

### STORM DRAINS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of storm drains. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
- 2.1 Reinforced Concrete Pipe: ASTM C 76 or AASHTO M 170.
- 2.2 Ductile Iron Pipe ANSI A 21.51 and fittings ANSI A 21.10
- 2.3 Clay Pipe: AASHTO M 65 or ASTM C 700.
- 2.4 Precast Reinforced Concrete Manholes: ASTM C 478 or AASHTO M 199.
- 2.5 Manhole Ladders or Steps shall be fabricated of steel or heavy duty aluminum, minimum 16 inches in width with 3/4-inch diameter or square rungs on 12-inch centers. Steel ladders and inserts shall be galvanized after fabrication.
- 2.6 Precast Concrete Segmental Blocks shall conform to ASTM C 139, and shall be not more than 8 inches thick nor less than 8 inches long.
- 2.7 Brick shall conform to ASTM C 62, Grade SW; ASTM C 55, Grade S-I or S-II, or ASTM C 32, Grade MS. Brick structures shall be plastered with 1/2-inch of mortar over the entire outside surface of the walls.
- 2.8 Walls and Headwalls shall be reinforced concrete, plain concrete, or steel sheeting as indicated.
- 2.9 Flared End Sections shall be a standard design with pipe manufacturer and manufactured of the same material as specified for the pipe.
- 2.10 Concrete for Structures: ACI 346.
- 2.11 Mortar shall be Composed of Portland cement, Portland blast-furnace slag, Portland-pozzolan, or masonry cement, as available.
- 3.0 EXECUTION:
- 3.1 Excavation:
- 3.1.1 Trenches: Except where banks are cut back on a stable slope, excavation for trenches shall be sheeted, braced, and shored as necessary for proper laying of pipe. Care shall be taken not to overexcavate. Remove stones as necessary to avoid point bearing.
- 3.1.2 Storm Sewers: The width of the trench at and below the top of the pipe shall be such that the clear space between the barrel of the pipe and the trench wall shall not exceed 8 inches on either side of the pipe. The width of the trench above that level shall be as wide as necessary of sheeting and bracing and the proper performance of the work.



- 3.1.3 Appurtenances: Excavation for manholes and similar structures shall be sufficient to leave at least 12 inches in the clear between the outer surfaces and the embankment or timber that may be used to hold and protect the banks.
- 3.2 Backfilling:
  - 3.2.1 Trenches: Backfill trenches to finish grade with approved materials. Replace pavement, base course, and compact subgrade disturbed by trenching operations in an acceptable manner with materials equal to the adjacent compacted subgrade, base course, and pavement for a minimum distance of 12 inches on each side of the trench and conform to the requirements hereinafter specified.
  - 3.2.2 Lower Portion of Trench: Deposit backfill material in 6-inch maximum thickness layers and compact with suitable tampers to the density of the adjacent soil until there is a cover of not less than 24 inches over lines, unless otherwise noted. The backfill material in this portion of the trench shall be free from stones larger than 3 inches in any dimension and hard clods and conglomerates larger than 6 inches in any dimension, compact to 95% maximum density in accordance with ASTM D 698.
  - 3.2.3 Remainder of Trench: Except for special materials for pavements and railroads, backfill the remainder of the trench with material that is free of stones larger than 6 inches or 1/2 the layer thickness, whichever is smaller, in any dimension. Deposit backfill material in layers not exceeding the thickness specified. Compact to an equal density of adjacent materials.
- 3.3 Installation:
  - 3.3.1 General: Under no circumstances shall pipe be laid in water. No pipe shall be laid when trench conditions or weather are unsuitable for such work. Diversion of drainage or dewatering of trenches during construction shall be provided as necessary.
  - 3.3.2 Concrete, Clay, and Asbestos Cement Pipe: Laying shall proceed upgrade with spigot ends of bell and spigot pipe and tongue ends of tongue and groove pipe pointing in the direction of the flow. Provide concrete cradles if soil is unsatisfactory.
  - 3.3.3 Manhole Ladders: Install manhole ladders when the manhole depth exceeds 12 feet or as directed by the Contracting Officer. Anchor ladders adequately to the wall by means of steel inserts spaced not more than 6 feet apart vertically. Provide at least 6-1/2 inches of space between wall and inside of rungs.

END OF SECTION 02520a





## 02000 - Site Work

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### SECTION 02520b

#### TRENCH DRAINS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing all materials and the installation of Trench Drains. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations or as directed by the Contracting Officer. Demolition and removal of materials shall be as required to support the work.
- 1.1 Provide certification that the completed trench drain system complies with the requirements of this section.
- 1.2 Submittals:
  - 1.2.1 Shop drawings showing a schematic layout of the drain system with all parts indicated in proper sequence, with dimensions and showing all outlet and/or inlet connections as well as dimensional locations of the Channel System.
  - 1.2.2 Material lists accompanying the shop drawings including: presloped channels, neutral and half channels, end caps, catch basins, grating and grating hold-down devices.
  - 1.2.3 Manufacturer's recommendations: Submit copies of the manufacturer's current recommended method of installation, including assembly and anchorage.
  - 1.2.4 Submit samples, if requested by the Contracting Officer, of the components of the trench drain system, for approval.
- 1.3 Delivery, Storage, and Handling:
  - 1.3.1 Use all means necessary to protect the presloped components and other materials of this Section from damage during delivery, jobsite handling and storage. Open pallets shall not be stacked. Do not stack materials of other trades on top of presloped components stockpiled at the jobsite. Protect the installed work and materials of other trades from damage.
  - 1.3.2 Schedule delivery of presloped drain components so that they arrive at the jobsite with adequate time to install and anchor them into place before adjoining concrete and asphalt pavement is to be placed. Schedule installation and connection of all underground plumbing concurrent with Preslope Drain Installation.
- 2.0 PRODUCTS:
  - 2.1 Manufacturers: Trench Drain System Components: Lonestar, Inc.
  - 2.2 Materials:
    - 2.2.1 Drain Channels:
      - 2.2.1.1 Precast polymer concrete, with a built-in-slope, or no slope at all, as indicated on the Drawings.



- 2.2.1.2 Channel Units: 6 1/4" wide at the top and of lengths to fit the conditions, as indicated on the Drawings; vertical side walls and a bottom with nominal 2" radius.
- 2.2.1.3 Tongue and groove ends that interlock fully and evenly with adjoining channels.
- 2.2.1.4 Provide an integral Gel lining on all inner flow surfaces.
- 2.2.2 Polymer Concrete: compressive strength of 14,500 psi and flexural strength of 2,900 psi.
- 2.2.3 Drainage Outlets: Provide outlet connections for X.H.C.I., DWV pipe (verify size), as indicated on the Drawings. Channels shall discharge through a catch basin equipped with a trash bucket.
- 2.2.4 End Caps: Close end of each drainage run with an interlocking end cap.
- 2.3 Design Criteria:
  - 2.3.1 Design: based upon precast polymer concrete channel drains presloped to provide a minimum slope of 0.6% in the channel; top is set level. Efficient flow and self cleaning characteristics shall be provided by a radiused channel bottom and a smooth integral Gel Lining over all wetted parts. (Design flows shall be as shown on the Drawings.)
  - 2.3.2 All Presloped Drain components shall be the product of one manufacturer.
  - 2.3.3 Catch Basin Units: Precast polymer concrete, where required. Catch basins shall be equipped with grate and galvanized steel trash buckets. Make discharge pipe connections according to local Standards.
  - 2.3.4 Gratings: Cast iron for all channels and catch basins. Grating shall bear evenly on the channel edges and shall provide an intake cross section of 10.5 square inches per linear foot. Install vandal-proof lock down bolts to hold the gratings firmly in place. Grating Section: length to match the channel sections.
- 3.0 EXECUTION:
  - 3.1 Install the polycast preslope drain system in strict accordance with manufacturer's recommendations and with approved Shop Drawings.
  - 3.2 Walk interlocking surfaces during installation. Clean all surplus calking off of wetted surfaces and grate gearing areas before it hardens.
  - 3.3 Install the presloped channels with the top edges level with adjoining surfaces.
  - 3.4 Laying Channels: Generally, channel laying shall begin at the deepest section or at the catch basin. Bedding material shall be adequate to provide support. Lay channels in numerical sequence with the arrow on the side of the unit pointing down stream toward the lower end of the system. Fully center channel ends at joints and keep the inner surfaces reasonably flush and even. Seal the joints in accordance with manufacturer's recommendation. Channels shall be firmly anchored to the subgrade and grates shall be installed across all joints so that the channels remain in position during concrete placement.
  - 3.5 Wherever bedding concrete is required for catch basin support, place concrete in the excavation to the specified thickness and level. Set catch basin on the fresh concrete after initial stiffening has occurred, but while the concrete is still wet enough to permit the catch basin to be worked into it slightly to establish firm and even support.



## 02000 - Site Work

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- 3.6      After adjoining concrete flatwork has been placed and finished, reset and lock down all gates securely. Clean all concrete splatter and waste out of the system. Do not plug or partially block drain outlets.

END OF SECTION 02521



## SECTION 02531

### SAND DRAINS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of sand drains. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Galvanized Perforated Corrugated Metal Pipe: AASHTO M36.
- 2.2 Aggregate shall be sand, gravel, crushed rock, or chat that is clean, sound, and of a good quality. Gradation shall conform to the following table:
- |                                |         |
|--------------------------------|---------|
| Retained on the 1-inch sieve   | 0%      |
| Retained on the 3/8-inch sieve | 0-15%   |
| Retained on the No. 8 sieve.   | 40-60%  |
| Retained on the No. 30 sieve   | 70-95%  |
| Retained on the No. 100 sieve  | 98-100% |
- 3.0 EXECUTION:
- 3.1 Pipe Bedding: Aggregate shall be placed in uniform layers on level excavation.
- 3.2 Perforated Pipe shall be laid with securely aligned joints to lines and grades, which will allow proper drainage.
- 3.3 Perforated Pipe shall be embedded with a minimum coverage of two feet of aggregate or as directed.
- END OF SECTION 02531



## SECTION 02551

### GAS DISTRIBUTION LINES

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of distribution lines including materials for repair and maintenance thereof. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
- 2.1 Piping for Gas Distribution Lines: Piping shall be steel, Schedule 40, ASTM A 120 or polyethylene, ASTM D 1248 and ASTM D 2513. Pipe designations shall be PE 2306 and PE 3306, designated for gas distribution.
- 2.2 Fittings for Steel Pipe:
- 2.2.1 Threaded: Applicable ASTM Standard
- 2.2.2 Welded: Butt-welded fittings shall conform to ANSI B16.9. Socket welded fittings shall conform to ANSI B16.11.
- 2.2.3 Flanged: ANSI B16.5.
- 2.2.4 Pipe Threads: NBS Handbook H28.
- 2.3 Valves: Valves shall conform to Mil. Spec. MIL-V-12003, type I, 175 psig. In plastic lines, valves shall be so designed as to protect against excessive torsional or shearing loads.
- 2.4 Protective Covering for Underground Steel Pipe: A coat of coal-tar primer, a coat of coal-tar enamel, a wrapper of coal-tar saturated felt, and a wrapper of kraft paper or a coat of water-resistant whitewash shall be applied in accordance with the requirements of AWWA C203.
- 3.0 EXECUTION:
- 3.1 Gas Lines: Plastic pipe shall not be installed above ground, in distribution systems that exceed 50 psig, or where operating temperatures of the materials will be below -20 F or above 100 F.
- 3.2 Installation of Gas Lines shall be in conformance with ANSI B31.5 and, where applicable, AGA Plastic Pipe Manual for Gas Service.
- 3.3 Gas Mains: shall have a minimum cover of 24 inches, and service lines shall have a minimum cover of 18 inches.
- 3.4 A Single Conductor No. 14 AWG Wire with type TW insulation shall be installed with plastic pipe to facilitate pipe locating.

END OF SECTION 02551



## SECTION 02555

### WATER LINES

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of water lines. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS: Piping for water service lines shall be polyvinyl chloride (PVC) plastic, polyethylene, polybutylene, or copper tubing. Piping for water distribution and supply lines shall be ductile iron, asbestos cement, polyvinyl chloride (PVC) plastic, filament-wound reinforced or centrifugally cast reinforced thermosetting resin, thermosetting reinforced plastic mortar pressure pipe, or reinforced concrete.
- 2.1 Copper Tubing: ASTM B 88, Type K, annealed, with compression pattern flared joints.
- 2.2 Ductile Iron Pipe: ANSI A21.51, 150 psi working pressure. Pipe shall be cement-mortar lined in accordance with ANSI A21.4. Joints shall conform to ANSI A21.11. Flanges shall conform to ANSI A21.15.
- 2.3 Polyvinyl chloride (PVC) Plastic Pipe: All pipe, couplings, and fittings shall be manufactured of material conforming to ASTM D 1784, Class 12454B, designated as PVC 1120 in ASTM D 1785.
- 2.3.1 Pipe Less Than 4 Inches in Diameter:
  - 2.3.1.1 Screw Joint: ASTM D 1785, Schedule 80, with joints meeting requirements of 150 psi working pressure, 200 psi hydrostatic test pressure.
  - 2.3.1.2 Elastomeric Gasket Joint: ASTM D 1785, Schedule 40, with joints meeting the requirements of 150 psi working pressure, 200 psi hydrostatic test pressure.
  - 2.3.1.3 Solvent Cement Joint: ASTM D 1785 or D 2241, with joints meeting the requirements of 150 psi working pressure and 200 psi hydrostatic test pressure.
- 2.3.2 Pipe, 4-Inch through 12-Inch Diameter: Pipe, couplings, and fittings shall conform to the requirements of AWWA C900, Class 150, C10D pipe dimensions, elastomeric gasket joint.
- 2.4 Reinforced and Prestressed Concrete Pipe: Steel cylinder reinforced concrete pipe shall conform to AWWA C300, C301, or C303 and shall be designed to withstand a working pressure of not less than 150 psi, with bell and spigot steel joints and gaskets.
- 2.5 Steel Pipe 3 Inches and Larger, not Galvanized: AWWA C200 with dimensional requirements as given to ANSI B36.10 for pipe 6 inches in diameter and larger, and ASTM A 120 for smaller sizes. Joints shall be mechanical, bell and spigot, or flanged. Pipe shall be coated with coal-tar primer followed by a hot coat of coal-tar enamel, a wrapper of asbestos felt impregnated with coal-tar, and a wrapper of kraft paper or a coat of water-resistant white wash.



## 02000 - Site Work

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- 2.6 Polyethylene Plastic (PE) Pipe Less than 3 Inches in Diameter: Pipe, tubing, and heat fusion fittings shall conform to AWWA C90I.
- 2.7 Polybutylene Elastic (PB) Pipe Less than 3 Inches in Diameter: Pipe, tubing, and fusion fittings shall conform to AWWA C902.
- 2.8 Filament Wound Reinforced Thermosetting Resin Pipe (RTRP-I) for Lines 3 Inches and Larger: ASTM D 2996, normal working pressure of 150 psi at 73 F.
- 2.9 Centrifugally Cast Reinforced Thermosetting Resin Pipe (RTRP-II) for Lines 3 Inches or Larger: ASTM D 2997.
- 2.10 Reinforced Plastic Mortar Pressure (RPMP) Pipe for Lines 3 Inches or Larger: ASTM D 3517, bell and spigot type joints with elastomeric or mechanical gaskets.
- 2.11 Filament Wound and Centrifugally Cast Reinforced Thermosetting Resin Pipe and Reinforced Plastic Mortar Pressure Pipe: Pipe shall have a quick burst strength equal to or greater than four times the normal working pressure of the pipe. The quick burst strength test shall conform to the requirements of ASTM 1599. Joints shall be bell and spigot type with elastomeric gaskets.
- 2.12 Valves:
  - 2.12.1 Check Valves shall be designed for a minimum working pressure of 150 psi. Valves 2 inches and smaller shall be all bronze with screwed fittings and shall conform to Fed. Spec. WW-V-5I, Class B. Valves larger than 2 inches shall be iron body, bronze-mounted with flanged ends, and non-slam type. Flanges Shall be the 125-pound type conforming to ANSI B16. 1.
  - 2.12.2 Gate Valves shall be designed for a working pressure of not less than 150 psi. Valves smaller than 3 inches shall be all bronze and shall conform to Fed. Spec. WW-V-54, Type I, Class B. Valves 3 inches and larger shall be iron body, bronze-mounted, and shall conform to AWWA C500.
  - 2.12.3 Rubber-Seated Butterfly Valves shall conform to the performance requirements of AWWA C504.
  - 2.12.4 Indicator Post for Valves shall conform to the requirements of NFPA No. 24.
- 2.13 Fire Hydrants: AWWA C502 or C503, and local Standards.
- 2.14 Fire Hydrant Hose Houses: NFPA No. 24, and local Standards.
- 2.15 Disinfection Materials: Liquid chlorine conforming to AWWA B301 or calcium or sodium hypochlorite conforming to AWWA B300.
- 3.0 EXECUTION:
  - 3.1 Installation:
    - 3.1.1 Water Lines shall not be laid in the same trench with sewer lines, gas lines, fuel lines, or electric wiring.
    - 3.1.2 Copper Tubing shall not be installed in the same trench with ferrous piping materials.
    - 3.1.3 Roads and Railroads: Sleeves under railroads shall be in accordance with the criteria contained in the Manual for Railway Engineering of the American Railway Engineering Association. Where sleeves are required in all other cases, the pipe sleeve shall be rigid conduit and shall have a minimum clearance of at least 2 inches between the inner wall of the sleeve and the maximum outside diameter of the sleeved pipe and joints shall be provided.



- 3.1.4 Structures: Where water pipe is required to be installed within three feet of existing structures, the water pipe shall be sleeved as required for roads and railroads.
- 3.2. Joint Deflection:
- 3.2.1 Ductile Iron Pipe: The maximum allowable deflection will be as given in AWWA C600.
- 3.2.2 Flexible Plastic Pipe: Maximum offset in alignment between adjacent pipe joints shall not exceed 5 degrees.
- 3.2.3 Reinforced Concrete Pipe: Maximum allowable deflections from a straight line or grade, as required by vertical curves, horizontal curves, or offsets, will be 5 degrees.
- 3.2.4 Steel Pipe: For pipe with bell and spigot rubber gasket Joints, maximum allowable deflections from a straight line or grade, as required by vertical curves, horizontal curves, or offsets will be 5 degrees.
- 3.3 Placing and Laying:
- 3.3.1 The Following Codes shall govern pipe installations: RTRP, ASTM D 3839; PE and PB, ASTM D 2774; PVC, AWWA M23 ; Asbestos Cement, AWWA C603.
- 3.3.2 Pipe Passing Through Walls of valve pits and structures shall be provided with cast-iron wall sleeves.
- 3.4 Service Lines: Service lines 2 inches and smaller shall be connected to the main in accordance with local standards by a directly tapped corporation stop or a service clamp. A corporation stop and a copper gooseneck shall be provided with either type of connection. Service lines 1-1/2 inches and smaller shall have a service stop. Service lines 2 inches or larger shall have a gate valve.
- 3.5 Setting of Fire Hydrants: Each hydrant shall be connected to the main with a 6-inch branch line having at least as much cover as the distribution main. Not less than 7 cubic feet of free draining broken stone or gravel shall be placed around and beneath the waste opening of dry barrel hydrants to ensure drainage.
- 3.6 Thrust Blocks: Plugs, caps, tees, and bends deflecting 22-1/2 degrees or more, either vertically or horizontally, on waterlines 6 inches in diameter or larger, and fire hydrants shall be provided with thrust blocking or metal tie rods and clamps or lugs.
- 3.7 Hydrostatic Tests: The pipeline shall be subjected to both a pressure test and a leakage test.
- 3.7.1 Pressure Test: After the pipe has been installed and the trench has been partially backfilled, leaving the joints exposed fore examination, the pipe shall be filled with water in a manner to expel all air. The pipeline shall be subjected to a test pressure of 100 psi or 150 percent of the working pressure, whichever is greater, for a period of at least one hour.
- 3.7.2 Leakage Test: A standard one-hour leakage test shall be performed subsequent to or concurrently with the pressure test and shall meet an allowable leakage rate according to the following formula:
- $$L = NDP/K, \text{ where}$$
- L equals the allowable leakage in gallons per hour, N is the number of field joints in the length of pipeline tested, D is the nominal diameter of the pipe in inches, P is the square root of the average test pressure in psig, and K is equal to 7,400.
- 3.8 Disinfection:. Each unit of completed water line shall be disinfected as prescribed by AWWA C60I.





## 02000 - Site Work

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END OF SECTION 02555



## SECTION 02557

### WATER RESERVOIRS AND TANKS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of elevated water tanks, ground level water tanks, and standpipes. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS: Standpipe, elevated steel water tank, or storage reservoir shall be in accordance with the applicable requirements of AWWA DI00 and AWWA DI02, except as modified herein.
- 2.1 Bolts, Anchor Bolts, and Rods for Welded Steel Tanks: ASTM A 307; galvanizing shall conform to ASTM A 153.
- 2.2 Reinforcing Steel: ASTM A 615, ASTM A 616, or ASTM A 617.
- 2.3 Plates: ASTM A 36.
- 2.6 Tubular Shapes: ASTM A 500, Grade B, for cold-formed; ASTM A 501 for hot-formed.
- 2.5 Design Loads: The following loads shall be considered in the design of tank structures and foundations:
  - A. Dead Loads: The unit weights for steel shall be 490 pcf and 144 pcf for concrete.
  - B. Live Load: Live load shall be the weight of all liquid when the tank is filled to just overflowing.
  - C. Wind Load and Snow Load: The elevated tank shall be designed according to AWSI A58.1 for a wind speed of 125 mph and for a snow load of 35 psf.
- 3.0 EXECUTION:
- 3.1 Foundations for the standpipe, reservoir, tank columns and riser, and for the valve chamber shall be constructed of concrete, reinforced where necessary, and designed in accordance with Section 12 of AWWA DI00 except as shown or specified herein. Footings shall be designed in accordance with ACI 318 and constructed in conformance with the applicable requirements of section: CONCRETE. The foundation for the reservoir shall be composed of a concrete ring at base of reservoir with bed of gravel under bottom of reservoir. After concrete ring walls are constructed, the gravel fill shall be placed to thickness shown on plans. Well-graded gravel or crushed stone, not exceeding 2 inches in size with no more than 5 percent passing the No. 200 sieve, shall be placed and thoroughly tamped or rolled at a moisture content that will yield a maximum density for the type of compaction equipment used. The material shall have a crowned surface of 1 inch vertical to 10 feet horizontal as a minimum to allow for the settlement and to ensure that tank bottom will be approximately level.
- 3.2 Anchors: A sufficient number of anchors, designed to prevent overturning of the standpipe, reservoir, or elevated storage tank, when empty, shall be installed. The anchors shall be not less than 1-1/4 inches in diameter and shall be set deep enough to resist the computed uplift. The anchors shall be



## 02000 - Site Work

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bent 90 degrees for anchorage in the concrete, or they shall be provided with anchor plates which may be made of scrap plates of structural steel channels. The anchor bolts shall be attached to the cylinder or anchor plates by means of properly designed lugs made of structural steel shapes or bent plates. Factor of safety on overturning under design wind load shall be 1.33 minimum. An inverted truncated pyramid of earth with 2 on 1 side slopes above top of footing may be used in determining overturning stability.

3.3 Test of Valves and Piping: After the tank has been erected and the valves and piping installed and before field painting is begun, the valves and piping shall be subjected for 1 hour to a hydrostatic pressure test of 1.33 times the anticipated static pressure at the points of reading when the system is put into operation.

3.4 Disinfection: Comply with requirements of AWWA D 105.

END OF SECTION 02557



## SECTION 02559

### SITE CHILLED WATER LINES

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance, and installation of site chilled water lines. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
  - 2.1 Piping and Fitting for Chilled Water Lines:
    - 2.1.1 Pipes to 4 Inches: Steel, welded, Schedule 40, ASTM A 120.
    - 2.1.2 Pipes 6 to 16 Inches: Steel, seamless or ERW, standard weight, ASTM A 120.
    - 2.1.3 Fittings to 1-1/2 Inches: MI, 150-pound, ASTM A 197, screwed ends ANSI B16.3.
    - 2.1.4 Fittings 2 to 16 Inches: Steel, seamless, standard weight, ASTM A 234, butt weld ends, ANSI B16.9.
    - 2.1.5 Unions to 2 Inches: MI, 150-pound, ASTM A 197, screwed ends, brass-to-iron seats.
    - 2.1.6 Unions 2-1/2 to 16 Inches: Flanged.
    - 2.1.7 Flanges 16 Inches and Under: Steel, ASTM A 105 or A 181, 150-pound, slip-on or welding neck type, ANSI B16.5.
    - 2.1.8 Gaskets-Water Service: Red rubber sheet, 1/16 inch thick, ring or full face as required, ASTM D 2000.
    - 2.1.9 Gaskets-Air Service: Compressed asbestos, 1/16 inch thick, ring or full-faced as required, ASIM F 104.
  - 2.2 Shutoff Valves for Chilled Water Lines:
    - 2.2.1 Gate Valves: Fed. Spec. WW-P 54D. Size 1/4 to 2 inches shall be screwed ends with bronze body. Size 2-1/2 to 16 inches shall be flanged ends with cast-iron body.
    - 2.2.2 Butterfly Valves: AWWA C504. Size 3 to 16 inches, wafer-flanged ends with cast-iron body.
  - 2.3 Control Valves for Chilled Water Lines:
    - 2.3.1 Globe Valves: Size 1/4 to 2 inches shall be screwed ends with bronze body. Size 2-1/2 to 10 inches shall be flanged ends with cast-iron body.
    - 2.3.2 Angle Valve: Size 1/4 to 2 inches shall be screwed ends with brass body. Size 2-1/2 to 14 inches shall be flanged ends with cast-iron body.
    - 2.3.3 Butterfly Valve: Size 3 to 16 inches shall be wafer-flanged with cast-iron body.
  - 2.4 Check Valves for Chilled Water Lines: Swing valves shall be size 1/4 to 2 inches, screwed ends with bronze body or size 2-1/2 to 16 inches, flanged ends with bronze body.



## 02000 - Site Work

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### 2.5 Pre-insulated Pipe Materials:

- 2.5.1 Foam Insulation: ASTM D 2341. Factory-applied polyurethane foam insulation shall completely fill the annular space between carrier pipe and jacket.
- 2.5.2 Jacketing Material: Material shall be extruded white non-toxic plastic, conforming to ASTM D 1784.
- 2.5.3 Joints shall be insulated with polyurethane foam, jacketed with non-toxic plastic or metal sleeves, and sealed with heat-shrinkable tape.
- 2.5.4 Fittings shall be insulated with polyurethane foam and jacketed with non-toxic plastic or metal fittings.

### 3.0 EXECUTION:

- 3.1 Preparation: .The trench bottom shall be stabilized by over-excavating 6 inches and replaced by fine graded earth or sand. After pipe is assembled in place and prior to testing, a partial backfill shall be accomplished by tamping fine graded earth or sand around the pipe in 6-inch layers to a minimum of 6 inches above the jacket, leaving joints exposed for visual inspection during hydrostatic testing.
- 3.2 Testing: .The joints of the chilled water lines shall be exposed for visual inspection during hydrostatic testing. After testing is complete, joints shall be covered in a similar manner and backfill operation shall proceed.

END OF SECTION 02559



## SECTION 02560

### SEWER LINE CLEANING

- 1.0 DESCRIPTION OF WORK: This specification covers sewer line cleaning. Cleaning procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS: All materials shall be clean, free of defects, corrosion, and damage. All items shall be of proper type, size, design, and characteristics for the use intended. Unless otherwise specified, all items shall be factory-made.
  - 2.1 Portable Cleaning Equipment: Equipment used in the cleaning of sewer lines shall be as required to complete the work for the size, length, and conditions of the sewer. Portable and mobile equipment shall comply with Water Pollution Control Federation Manual No. 7.
  - 2.2 Chemicals shall be of the strength required to perform the work. The chemicals shall not be damaging to pipe materials, manholes, pumping equipment, nor treatment process and shall not be contaminated by foreign substances.
- 3.0 EXECUTION:
  - 3.1 Preparation:
    - 3.1.1 Protection required to prevent damage to adjacent materials, equipment, fixtures, and finishes shall be provided. Necessary protective clothing and accessories for personnel working with chemicals shall be provided.
    - 3.1.2 Ventilation of Sewers: Contractor shall provide proper ventilation for personnel working in the sewer.
    - 3.1.3 Alternate Sewage Discharge: Contractor shall provide an alternate routing of sewage discharge to a downstream manhole.
    - 3.1.4 Traffic: Contractor shall provide all traffic signs required to safely direct traffic at and around work areas.
  - 3.2 Installation:
    - 3.2.1 Direction of Work: Sewer line cleaning work, with the exception of hydraulic scouring, shall proceed in the downstream direction. Cleaning by hydraulic scouring shall proceed in the upstream direction.
    - 3.2.2 Testing: Upon completion of cleaning operation, test sewer lines for proper operation and observe for a period of 24 hours. Clean out all stoppages and the retest the line for proper operation.

END OF SECTION 02560



## SECTION 02561

### SEPTIC TANKS AND GREASE TRAPS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of septic tanks and grease traps. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS: Concrete Repair Material shall be epoxy type grout.
- 3.0 EXECUTION:
- 3.1 Septic Tanks and Grease Traps shall be drained and cleaned.
- 3.2 Adequate Ventilation shall be provided and precautions against the presence of explosive vapors shall be taken if it is necessary to enter the septic tank.
- 3.3 Soil Absorption System: Remove and dispose of vegetation roots impeding the flow of water in the soil absorption system properly. Restore all noticeable irregularities in the ground surface, caused by removal, by filling with soil that matches surrounding soil.
- 3.4 Filling Abandoned Septic Tanks and Grease Traps: Clean and fill abandoned septic tanks and grease traps with compacted soil in accordance with all environmental and local standards.

END OF SECTION 02561



## SECTION 02611

### CRUSHED STONE BASE

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of crushed stone base. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Aggregates: Aggregates shall consist of crushed stone or slag, crushed gravel, angular sand, or other approved materials. Aggregates shall be durable, sound, and free from foreign material.
- 2.1.1 Coarse Aggregates, consisting of angular fragments of uniform density and quality, shall have a percentage of wear not to exceed 50 percent after 500 revolutions when tested in accordance with ASTM C 131. The amount of flat and elongated particles (length to width greater than 3 to 1) shall not exceed 30 percent.
- 2.1.2 Crushed Gravel shall be manufactured from gravel particles with the following gradation:
- |                  |            |
|------------------|------------|
| 100% passing     | 2" sieve   |
| 25 - 60% passing | 1/4" sieve |
| 5 - 40% passing  | #40 sieve  |
| 0 - 10%          | #200 sieve |
- 2.1.3 Crushed Stone shall contain at least 50 percent by weight of crushed pieces having two or more freshly fractured faces for each range of sizes.
- 2.1.4 Slag shall be an air-cooled blast-furnace product having a dry weight of not less than 65 pcf.
- 2.2 Binder Material shall consist of screenings, angular sand, or other finely divided mineral matter processed or naturally combined With the coarse aggregate. .
- 3.0 EXECUTION:
- 3.1 Preparation: The previously constructed layer or base shall be cleaned of loose and foreign matter. Adequate drainage shall be provided. Ruts or soft spots shall be corrected. For cohesionless underlying materials, the surface shall be stabilized with aggregate prior to placement of the stabilized-aggregate course.
- 3.2 Installation:
- 3.2.1 Mixing and Placing: Materials shall be mixed in such a manner as to obtain a uniform stabilized-aggregate material and a uniform optimum water content for compaction. Mixing and placing procedures shall produce true grades, minimize segregation and degradation, optimize water content, and ensure a satisfactory base course.





## 02000 - Site Work

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- 3.2.2      Compaction: Each layer of stabilized-aggregate paving shall be compacted. Water content shall be maintained at optimum. Areas inaccessible to the rollers shall be compacted, with mechanical tampers and shall be shaped and finished by hand methods.
- 3.2.3      Layer Thickness: No layer shall be in excess of 8 inches nor less than 3 inches in compacted thickness.
- 3.2.4      Proof Rolling: Materials in paving or underlying materials that produce unsatisfactory results by rolling shall be removed and replaced with satisfactory materials and recompact.
- 3.2.5      Edges of Paving: Approved materials shall be placed along edges of stabilized-aggregate paving course in such quantities as will compact to thickness of the course being constructed, allowing at least a 1-foot width of the shoulder to be rolled and compacted simultaneously with rolling and compacting of each layer of the paving course.
- 3.2.6      Finishing: Finished surface shall be of uniform grade and texture.
- 3.2.7      Thickness Control: Compacted thickness of the stabilized paving course shall be within 1/2 inch of the thickness required.

END OF SECTION 02611



## SECTION 02612a

## BITUMINOUS PAVING

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of asphaltic concrete overlays. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
- 2.1 Asphalt Cement: The asphalt cement shall comply with ASTM D 946 penetration grade 85-100 requirements and shall show a negative spot test when tested in compliance with AASHTO T 102.
- 2.2 Mineral Aggregates: Shall comply with ASTM D 3515 for 3/4-inch maximum aggregate mix.
- 2.3 Test Properties: The bituminous mixture shall meet the following requirements:
- |                               |       |
|-------------------------------|-------|
| Stability minimum, lb         | 500   |
| Flow maximum, 1/100-in. units | 20    |
| Voids total mix, %            | 3-5   |
| Voids filled with bitumen, %  | 75-85 |
- 3.0 EXECUTION:
- 3.01 Preparation of Existing Surface: The Contractor shall raise and reset all structures such as manhole frames, valve boxes, drainage structures, etc., to meet the required grade. An asphalt tack coat shall be applied to all contact surfaces in advance of the asphalt concrete overlay placement. The asphalt tack shall be placed at an asphalt residue coverage minimum rate of 0.05 gal/sq yd.
- 3.0.2 In sinkage areas and other locations where paving thickness required is in excess of 1 1/2 inches the new asphaltic concrete surfacing shall be laid in two courses, the first course to be firmly compacted and leveled off 1 1/2 inches below finished pavement surface and allowed to harden before application of the topping. Thoroughly clean and remove all loose and foreign material from existing pavement surfaces at base of new surface course.
- 3.0.3 Plant Mixing: All ingredients shall be carefully weighed in the designated proportion. Moisture content of aggregate at time of mixing shall not exceed 0.5%. Temperature of mixture shall not exceed 326° F. at plant but all ingredients shall be heated so that mixture temperature at delivery to site is not less than 250° F. Asphalt shall be heated so that it will be sufficiently fluid to produce a uniform coating on every aggregate particle. Mixing shall continue until a uniform homogeneous completely coated mixture is obtained.
- 3.0.4 Transportation Of Mix: Transport mixtures in tight clean vehicles free of kerosene and other solvents and foreign materials. Provide covers to insulated vehicles as required to maintain specified mixture temperatures.



## 02000 - Site Work

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- 3.0.5 Application Of Asphaltic Concrete Surface Course Prequalification: All asphalt paving work shall be laid by persons directly employed by a Company who has laid similar pavement successfully for the last three (3) years.
- 3.0.6 Depositing And Spreading: Upon arrival at the site asphaltic mixtures shall be dumped and spread in orderly continuous operation. Care shall be taken to prevent the material from becoming mixed with earth or other foreign matter or being prematurely consolidated by traffic or trucks. It shall be spread by means of shovels, rakes, or approved spreading devices without segregation and such that all ingredients are uniformly distributed, No walking on the surface mixture shall be permitted during the laying operation. Spread in a loose layer or layers of such thickness that after compaction it shall produce a uniform surface having the minimum thickness specified.
- 3.1 Adverse Weather:
- 3.1.1 Freezing Weather: No materials, except with permission of the Contracting Officer, shall be mixed or placed when air temperature is 50° F. or lower. No materials containing frost shall be used.
- 3.1.2 Wet Weather: Generally the laying of surface mixtures will not be permitted in wet weather. The Superintendent may however permit work to continue when overtaken by sudden rain, but only up to the amount which is in transit when overtaken by sudden rain. Plant mixing shall cease when rain commences and laying of pavement shall not be resumed until all conditions are satisfactory as specified herein.
- 3.1.3 Protection: The Contractor shall provide and have ready for use at all times, sufficient tarpaulins or covers for use in any emergency such as rain, chilling winds or unavoidable delay, for the purpose of covering or protecting any material that may be dumped but not spread immediately.
- 3.2 Installation
- 3.2.1 Construction Joints: Construction of the topping course shall be as nearly continuous as is possible. When operation of laying is interrupted, the end of laid material shall be left unrolled until such time as work is resumed, in order that there may be no joints throughout the project. If it is necessary to roll the end of the laid mixture during construction or permit traffic to pass over such temporary end, thus consolidating it, the edge so made shall be cut back vertical before recommencing the operation of laying, in order to present a fresh clean surface for contact with the newly placed material. The edges of such joints shall not be painted with liquid bitumen and the use of hot smoothing irons in finishing such joints shall not be permitted. Construction joints shall be thoroughly rolled to insure proper bond between adjoining spreads.
- 3.2.2 All Asphalt Concrete Mixture and Pavement that are contaminated, damaged, or defective shall be removed and replaced by the Contractor. Skin patching of rolled pavement will not be permitted.
- 3.2.3 Side Supports: If, at the time of laying the topping, temporary side supports are required at curbs, gutters or edgings, timber or other temporary supports of suitable thickness shall be placed along edge of the pavement and rigidly supported so as to prevent the mixture from being displaced by the action of the roller. These temporary supports shall remain in place until the surface course has been thoroughly rolled with overlapping roller so as to thoroughly consolidate the extreme edges.
- 3.2.4 Surface Finish: The finished surface after compaction shall be smooth and true to grades; free from spots, cracks, waves, bunches, unevenness or other surface defects; and shall slope to drains throughout entire area and be free from sinkages and other obstructions which will hold water. Finish



## 02000 - Site Work

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pavement shall be uniform in texture and density throughout. Finish surface flush with existing pavement at gates, steps, covers and other fixed grade points. Contractor shall furnish straight edge not less than ten (10) feet long and check surface frequently during rolling operations to detect surface defects. Defects and irregularities which are detected before the completion of rolling shall be remedied by loosening the surface mix and removing or adding materials as may be required. Should any irregularities or defects remain after the final compaction the surface course shall be removed promptly and sufficient new material laid to form a true and even surface. All minor surface defects shall be ironed smooth to grade.

END OF SECTION 02612a



## SECTION 02612b

### SPRAY APPLICATIONS, SEAL COATS, AND SURFACE TREATMENTS (also covers 02617)

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for the spray applications, seal coats, and surface treatments of asphalt concrete pavements. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
  - 2.1 Bituminous Material: Bituminous material shall be liquid asphalt complying with ASTM D 2028, Grade RC-250, or tar complying with ASTM D 490, Grade RT-6.
  - 2.2 Aggregate: Aggregates shall consist of crushed stone, crushed gravel, or crushed slag. The moisture content of the aggregate shall be such that the aggregate will be readily coated with the bituminous material. Aggregate gradations shall be in compliance with ASTM C 136.
  - 2.3 Construction Equipment:
    - 2.3.1 Bituminous Distributor shall be designed and equipped to distribute the bituminous material uniformly at even heat on variable widths of surface at readily determined and controlled rates and pressures recommended by the manufacturer and with an allowable variation from any specified rate not exceeding 5 percent.
    - 2.3.2 Single-Pass Surface Treatment Machine shall be capable of distributing the bituminous material and aggregates uniformly in controlled amounts in a single-pass operation over the surface to be sealed.
    - 2.3.3 Heating Equipment for Storage Tanks shall consist of steam coils, hot oil coils, or electrical coils. If steam or hot oil coils are used, the coils must be so designed and maintained that the bituminous material cannot become contaminated.
    - 2.3.4 Power Rollers shall be the self-propelled tandem and three-wheel type rollers, weighing not less than 5 tons and shall be suitable for rolling bituminous pavements.
    - 2.3.5 Self-Propelled Pneumatic-Tired rollers shall have a total compacting width of not less than 60 inches. The gross weight shall be adjustable within the ranges of 200 to 350 lb/in. of compacting width.
    - 2.3.6 Spreading Equipment: Aggregate spreading equipment shall be adjustable and capable of spreading aggregate at controlled amounts per square yard.
    - 2.3.7 Drags: Broom drags shall consist of brooms mounted on a frame, designed to spread fine aggregate uniformly over the surface of a bituminous pavement. Towing equipment shall have pneumatic tires.
    - 2.3.8 Brooms and Blowers shall be of the power type and shall be suitable for cleaning surfaces of bituminous pavements.



3.0 EXECUTION:

3.1 Preparation of Surface:

3.1.1 Immediately Before Application of the Spray, all loose material, dirt, clay, or other objectionable material are to be removed from the surface with a power broom or blower supplemented with hand brooms. Correct all deficient areas such as pot holes, depressions, and excessive cracking.

3.1.2 Application of Bituminous Material: Immediately following the preparation of the surface, apply the bituminous material uniformly over the entire surface to be treated. All spots missed by the distributor shall be properly treated with bituminous material.

3.1.3 Application Temperature: Application temperatures for all materials shall comply with provisions of the Asphalt Institute Publications and the applicable ASTMs.

3.2 Installation:

3.2.1 Spreading Aggregate: Application of seal aggregate shall immediately follow the application of bituminous material, and in no case shall the time to application exceed 15 minutes.

3.2.2 Brooming and Rolling: Begin the rolling operations immediately following the application of cover aggregate. Rolling shall be accomplished with pneumatic-tired rollers; steel-wheeled rollers shall be used in a supplementary capacity only. All surplus aggregate shall be swept off the surface and removed not less than 26 hours or more than four days after rolling is completed.

END OF SECTION 02612b



## 02000 - Site Work

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### SECTION 02614a

#### PORTLAND CEMENT CONCRETE

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of Portland cement concrete (PCC) pavements. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
- 2.1 Ready-Mixed Concrete shall comply with ASTM C 94, Alternative No. 2. The concrete shall have a slump of not more than three inches. The concrete shall attain a minimum compressive strength of 3200 psi at 28 days.
- 2.2 Aggregates shall comply with ASTM C 33.
- 2.3 Air Entraining Admixtures shall comply with ASTM C 260.
- 2.4 Concrete Curing Materials shall comply with one of the following:
- 2.4.1 Burlap: AASHTO M182 .
- 2.4.2 White, Opaque Polyethylene-Coated Burlap: ASTM C 171.
- 2.4.3 White, Opaque Polyethylene Sheeting: ASTM C 171.
- 2.4.4 White Waterproof Paper: ASTM C 171.
- 2.4.5 Liquid Membrane Curing Compound: ASTM C 309.
- 3.0 EXECUTION: (Not used.)

END OF SECTION 02614a



## SECTION 02616a

### BITUMINOUS PAVING - REPAIR AND RESURFACING

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials repair and resurfacing of bituminous pavements. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
  - 2.1 Asphaltic Concrete:
    - 2.1.1 Hot-Mixed, Hot-Mixed Asphaltic Concrete and Emulsified asphalt shall comply with requirements of ASTM D 3515.
    - 2.1.2 Plant-Mixed, Stockpiled Asphalt Cold Mixes shall comply with the requirements of Asphalt Institute Specification PM-2.
  - 2.2 Bituminous Prime: Bituminous prime shall comply with ASTM D - 2027.
  - 2.3 Base Course: Base course material shall comply with Texas highway department specification for dense-graded, high-quality material.
  - 2.4 Bituminous Tack Coat: Bituminous tack coat shall comply with ASTM D 2027.
- 3.0 EXECUTION:
  - 3.1 Preparation of Areas for Patching:
    - 3.1.1 Pot Holes: Trim the perimeter of each hole to a vertical face with a carborundum blade in a square or rectangular pattern at least 18 inches from ragged edge. Remove material to a depth that provides a uniform well-compacted bottom surface. Remove all loose material resulting from trimming or otherwise existing in the hole. If subbase is disturbed, reestablish in a like manner to adjacent substrate. Areas to be repaired shall be dry before repair is started.
    - 3.1.2 Alligator-Cracked and Rutted Areas: The pavement shall be sawed or cut with pavement breakers to a smooth vertical face 18 inches outside of the alligator-cracked area. Unsatisfactory material shall be removed in a manner not to disturb the sides of the excavated area.
    - 3.1.3 Slippage Areas: Saw a rectangular area around the slippage area that overlaps into the well-bonded material by at least 18 inches. The depth of the saw cut shall be equal to the thickness of the layer of material that is slipping. The surface where slipping is occurring shall be broomed clean and all loose material removed.
  - 3.2 Installation:
    - 3.2.1 Application Temperatures: Application temperatures for all asphalt material shall comply with provisions of the Asphalt Institute Publications and the applicable ASTM.





## 02000 - Site Work

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- 3.2.2 Base Course: Place base course material in layers not exceeding a compacted thickness of 6 inches. After placing, compact each layer by mechanical compactors to a density of not less than the density of the corresponding layer of the adjacent pavement structure.
- 3.2.3 Prime Coat: Prime base course with MC-70 liquid asphalt at a rate of 0.20 to 0.30 gallon per sq. yd. Bolt excess prime with sand before the surfacing material is applied.
- 3.2.4 Tack Coat: Give the edges of existing asphaltic concrete or surfaces of Portland cement concrete and asphaltic concrete a tack coat of MC-70 liquid asphalt at a rate of 0.05 to 0.15 gallon per sq. yd. Allow the material to cure before placing the surfacing material.
- 3.2.5 Hot-Mixed Asphaltic Concrete: Place the material in layers not exceeding 2-1/2 inches in thickness and compact to a density equal to the density of the adjacent asphaltic concrete.
- 3.2.6 Stockpiled Cold Mixes: The compacted thickness of each layer of material shall not exceed 2 inches. Before compaction, the material shall be allowed to aerate, if necessary, until the proper amount of cohesion has developed to obtain adequate compaction. When more than one layer is used, each layer shall be thoroughly cured before the succeeding layer is placed.

END OF SECTION 02616a



## SECTION 02616b

### CRACK SEALING OF BITUMINOUS PAVEMENTS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for crack sealing of bituminous pavements. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
  - 2.1 Liquid Asphalt shall comply with ASTM D 2027, Grade MC-250.
  - 2.2 Emulsified Asphalt shall comply with ASTM D 977, Grade as-2.
  - 2.3 Sealing Compound shall comply with applicable ASTM requirements.
  - 2.4 Fine Aggregate shall be natural sand or crusher dust and have a maximum size of not more than 1/8 inch and be free of clay or organic-matter.
- 3.0 EXECUTION:
  - 3.1 Preparation:
    - 3.1.1 All Cracks to be sealed shall be cleaned of dirt and debris, and moisture shall be removed..
    - 3.1.2 Crack Cleaning Equipment shall consist of a portable air compressor with hose and nozzles for directing air directly into cracks and stiff bristle brooms.
    - 3.1.3 Heating Equipment for Liquid Asphalt shall be mobile and shall be equipped with an agitating device for stirring material during heating, a thermometer, regulating equipment for heat control, and a gravity-type draw-off valve.
    - 3.1.4 Heating Equipment for Sealing Compound: Unless otherwise required by the manufacturer's recommendations, the equipment shall be mobile and shall consist of double-boiler, agitator-type kettles with oil medium in the outer space for heat transfer. The applicator unit shall be so designed that the sealant will circulate through the delivery hose and return to the inner kettle when not sealing cracks.
    - 3.1.5 Application Equipment shall have a spout or nozzle of such size that the sealing material will be placed in the cracks without entrapping air in cracks or spreading material on adjacent pavement surface.
  - 3.2 Installation:
    - 3.2.1 Sealing Compound: All cracks 1/8 inch wide and wider shall be sealed. The application temperature for sealing compound shall comply with applicable ASTM Standards. Cracks 1/2 inch wide and wider shall be filled with a slurry of fine sand and an emulsified asphalt or liquid asphalt. After the slurry has cured, cracks shall be sealed with liquid asphalt or emulsified asphalt and lightly sanded.



## 02000 - Site Work

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- 3.2.2 Liquid and Emulsified Asphalt Sealer: The temperature shall be varied so that it flows freely into cracks and completely fills cracks without entrapping air. Cracks shall be free of moisture before filling and shall be filled slightly above the pavement surface. When excess sealer has been removed, the sealer shall be covered with fine sand.
- 3.2.3 Traffic Control: Traffic will not be permitted over sealed cracks until the sealer has cooled so that it is not picked up by vehicle tires. The Contractor will be responsible for all barricades and flag men necessary to control traffic.

END OF SECTION 02616b



## SECTION 02618a

### TRACK, COURT, AND PLAYGROUND MARKINGS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing of materials and the installation of Track, Court, and Playground Markings. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.1 Submittals:
  - 1.1.1 Submit product data and manufacturer's recommendations for each marking to be furnished.
  - 1.1.2 Submit sample of each marking to be furnished.
  - 1.1.3 Submit "Line Layout Drawing" prior to installation of marking and upon completion of markings, submit three (3) certified line layout drawings indicating all lines and colors.
- 1.2 Quality Assurance:
  - 1.2.1 Personnel shall have a minimum of three years marking experience.
  - 1.2.2 Markings shall conform to the requirements of (1.) The National Federation of State High School Athletic Association and/or (2.) Standards set forth by the Contracting Officer.
- 1.3 Delivery, Storage and Handling:
  - 1.3.1 Deliver paint to site in original sealed containers or drums, with labels legible, intact and unbroken.
  - 1.3.2 Comply with all health and fire regulations.
- 1.4 Environmental Requirements:
  - 1.4.1 Do not install markings on wet or frozen surfaces.
  - 1.4.2 Comply with manufacturer's instructions for temperature requirements.
- 2.0 PRODUCTS:
  - 2.1 Manufacturers:
    - 2.1.1 Line Paint for Resilient Surface: Aliphatic polyurethane paint such as Hi-Build Aliphatic Polyurethane paint by Sherwin Williams.
    - 2.2.2 Line Paint for Asphaltic Concrete Pavement: Latex traffic marking paint such as Setfast Latex Traffic Marking paint by Sherwin Williams.
    - 2.2.3 Line Paint for Athletic Wearing Surface (Plexipave): 100% acrylic latex paint such as Plexicolor by California Products.
- 3.0 EXECUTION:
  - 3.1 Preparation:



## 02000 - Site Work

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- 3.1.1 Protect surfaces not to be painted. Avoid spray of any kind.
- 3.1.2 Prepare surface to satisfaction of the Contracting Officer prior to line painting.
- 3.1.3 Remove by broom, vacuum or blower all dust, dirt, loose materials on surface to be painted.
- 3.1.4 Comply with manufacturer's latest requirements and recommendations.
- 3.2 Application:
  - 3.2.1 Line Painting:
    - 3.2.1.1 Accurately measure and layout line markings.
    - 3.2.1.2 Apply paint with mechanical equipment.
    - 3.2.1.3 Paint lines as specified below under "Track Marking".
    - 3.2.1.4 Provide uniform straight edges.
    - 3.2.1.5 Apply not less than two coats in accordance with manufacturer's recommended rates.
    - 3.2.1.6 Lines shall be 2" wide unless otherwise specified.
  - 3.2.2 Track Marking:
    - 3.2.2.1 Employ a licensed land surveyor to accurately measure and lay out line markings in accordance with National Federation of State High School Athletic Assoc. Regulations.
    - 3.2.2.2 Events:

1. 100 meter dash	8. 4 x 100 meter relay
2. 200 meter dash	9. 4 x 200 meter relay
3. 400 meter dash	10. 4 x 400 meter relay
4. 800 meter run	11. 110 meter high hurdles
5. 1500 meter run	12. 400 meter intermediate hurdles
6. 3000 meter run	13. Girls 100 meter hurdle
7. One mile run	
    - 3.2.2.3 Hurdle location markers      yellow hash marks.
    - 3.2.2.4 Lane lines      white (min. 42" apart).
    - 3.2.2.5 Exchange zones      4 x100 - green, 4 x 200 - blue, 4 x 400 - yellow, 12" across entire lane width.
    - 3.2.2.6 Lane numbers      Stenciled in three locations from inside-out. Numbers shall be 24" high and white in color.
    - 3.2.2.7 Finish line to be located near bleachers.
    - 3.2.2.8 All starts and finishes to be white.
- 3.3 Cleaning: Upon completion of work, remove containers and debris and leave site in clean orderly condition acceptable to the Contracting Officer.
- 3.4 Protection:
  - 3.4.1 Erect temporary barriers to protect paint during drying period.



3.4.2 Protect markings from damage until completion of project.

END OF SECTION 02618a



## SECTION 02618b

### PAVEMENT MARKINGS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and replacement of pavement markings. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
  - 2.1 General: Paint and reflective media shall be in sealed containers that plainly show the designated name, formula or specification number, batch number, color, date of manufacturer, manufacturer's name, formulation number, and directions, all of which shall be plainly legible at time of use. The paint shall be homogeneous and easily stirred to smooth consistency. Paint that is older than one year shall not be used.
  - 2.2 Paint:
    - 2.2.1 Paint for Roads and Streets shall comply with applicable ASTM and local DOT Standards.
  - 2.3 Reflective Media shall comply with MUTCD requirements.
  - 2.4 Thermoplastic Materials shall comply with AASHTO specification M249.
  - 2.5 Raised Pavement Markers shall comply with the Federal Highway Administration Manual on Uniform Traffic Control Devices:
    - 2.5.1 Reflective Pavement Markers: Reflective pavement markers shall be of the prismatic reflector type, consisting of a high impact plastic shell filled with a mixture of inert thermosetting compound and filler material.
    - 2.5.2 Nonreflectorized Pavement Markers: Nonreflective pavement markers shall consist of a heat fired, white, vitreous, ceramic base and a heat-fired, opaque, glazed surface to produce the properties in these specifications.
  - 2.6 Adhesive for Installation of Raised Pavement Markers shall comply with AASHTO M237.
- 3.0 EXECUTION:
  - 3.1 Preparation:
    - 3.1.1 Safety and Protection: Contractor shall assure the least possible obstruction to traffic and most protection to pedestrians.
    - 3.1.2 Removal of Existing Pavement Marking: Remove paint, plastic markings, and raised markers by sandblasting, infrared heat, high pressure water, and water or scraping. Heat may be used to augment scraping; however, the underlying pavement shall not be burned.



- 3.2.1 Thermoplastic Applicator: Utilize extrusion or spray application equipment for applying thermoplastic material to the pavement. The equipment shall provide for varying widths of traffic markings.
- 3.2.2 Bead Dispensers: Attach bead dispensers to the striping machine in such a manner that the beads are dispensed almost instantaneously upon the installed line.
- 3.2.3 Tolerances in Dimensions and in Alignment: The length of the painted segment for skip stripe and the gap between segments may each vary plus or minus one foot, except that over-tolerance and under-tolerance lengths shall approximately compensate. Sizes of lines shall be to match existing or directed by the Contracting Officer.
- 3.2.4 Protection: Adequate warning signs, flag men, and necessary precautions for the protection of the wet paint and the safety of the public shall be provided. Cones, rubber "Z" guards or similar protective devices shall be placed along the newly painted stripe to prevent traffic from crossing the wet paint.
- 3.2.5 Corrective Measures: Stripes that fail to meet the specifications, including the permissible tolerances and the appearance requirements, or are marred or damaged by traffic or from other causes, shall be corrected. Drip and spattered paint shall be removed.

END OF SECTION 02618b





## SECTION 02619

### CRUSHED STONE PAVING

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of crushed stone paving. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Aggregates: Aggregates shall consist of crushed stone or slag, crushed gravel, angular sand, or other approved materials. Aggregates shall be durable, sound, and free from foreign material.
- 2.1.1 Coarse Aggregates, consisting of angular fragments of uniform density and quality, shall have a percentage of wear not to exceed 50 percent after 500 revolutions when tested in accordance with ASTM C 131. The amount of flat and elongated particles (length to width greater than 3 to 1) shall not exceed 30 percent.
- 2.1.2 Crushed Gravel shall be manufactured from gravel particles with the following gradation:
- |                  |            |
|------------------|------------|
| 100% passing     | 2" sieve   |
| 25 - 60% passing | 1/4" sieve |
| 5 - 40% passing  | #40 sieve  |
| 0 - 10%          | #200 sieve |
- 2.1.3 Crushed Stone shall contain at least 50 percent by weight of crushed pieces having two or more freshly fractured faces for each range of sizes.
- 2.1.4 Slag shall be an air-cooled blast-furnace product having a dry weight of not less than 65 pcf.
- 2.2 Binder Material shall consist of screenings, angular sand, or other finely divided mineral matter processed or naturally combined With the coarse aggregate. .
- 3.0 EXECUTION:
- 3.1 Preparation: The previously constructed layer or base shall be cleaned of loose and foreign matter. Adequate drainage shall be provided. Ruts or soft spots shall be corrected. For cohesionless underlying materials, the surface shall be stabilized with aggregate prior to placement of the stabilized-aggregate course.
- 3.2 Installation:
- 3.2.1 Mixing and Placing: Materials shall be mixed in such a manner as to obtain a uniform stabilized-aggregate material and a uniform optimum water content for compaction. Mixing and placing procedures shall produce true grades, minimize segregation and degradation, optimize water content, and ensure a satisfactory base course.



- 3.2.2      Compaction: Each layer of stabilized-aggregate paving shall be compacted. Water content shall be maintained at optimum. Areas inaccessible to the rollers shall be compacted, with mechanical tampers and shall be shaped and finished by hand methods.
- 3.2.3      Layer Thickness: No layer shall be in excess of 8 inches nor less than 2 inches in compacted thickness.
- 3.2.4      Proof Rolling: Materials in paving or underlying materials that produce unsatisfactory results by rolling shall be removed and replaced with satisfactory materials and recompact.
- 3.2.5      Edges of Paving: Approved materials shall be placed along edges of stabilized-aggregate paving course in such quantities as will compact to thickness of the course being constructed, allowing at least a 1-foot width of the shoulder to be rolled and compacted simultaneously with rolling and compacting of each layer of the paving course.
- 3.2.6      Finishing: Finished surface shall be of uniform grade and texture.
- 3.2.7      Thickness Control: Compacted thickness of the stabilized paving course shall be within 1/2 inch of the thickness required.

END OF SECTION 02619



## 02000 - Site Work

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### SECTION 02620a

#### CONCRETE CURBS AND GUTTERS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of concrete curbs and gutters. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
  - 2.1 Concrete Curing Materials:
    - 2.1.1 Burlap: ASHTO M 182 having a weight of 14 ounces or more per square yard when dry.
    - 2.1.2 Impervious Sheeting: ASTM C 171.
    - 2.1.3 Liquid Membrane Curing Compound: ASTM C 309. Compound shall be free of paraffin or petroleum.
  - 2.2 Joint Materials:
    - 2.2.1 Expansion Joint Fillers: ASTM D 1751 or ASTM D 1752.
    - 2.2.2 Joint Sealers: ASTM D 1850.
  - 2.3 Concrete: Concrete shall have a minimum compressive strength of 3200 psi in 28 days. The maximum size of aggregate shall be 1-1/2 inches. Concrete shall have a slump of not more than 3 inches and an air content by volume of concrete of 4 to 7 percent.
  - 2.4 Forms: Curb and gutter forms shall be of wood or steel. The outside forms shall have a height equal to the full depth of the curb or gutter. The inside form of curb shall have batter and shall be securely fastened to and supported by the outside form. Wood forms shall be surfaced plank, 2-inch nominal thickness, straight and free from warp, twist, loose knots, splits, or other defects. Corners, deep sections, and radius bends shall have additional stakes and braces, as required. Radius bends may be formed with 3/4-inch plywood. Steel forms shall be channel-formed sections with a flat top surface and with welded braces at each end and at not less than two intermediate points. Form ends shall be interlocked and self-aligning. Forms shall include flexible forms for radius forming, corner forms, form spreaders, and fillers.
- 3.0 EXECUTION:
  - 3.1 Preparation: The subgrade shall be constructed to grade and cross section. The subgrade shall be of materials equal in bearing quality to the subgrade under the adjacent pavement and shall be compacted and extended the full width of the gutter. The subgrade shall be maintained in a smooth, compacted condition, in conformity with the required section and established grade until the concrete is placed. The subgrade shall be in a moist condition when concrete is placed.
  - 3.2 Installation:



- 3.2.1 Form Setting: Forms for curbs shall be carefully set to alignment and grade and to conform to the dimensions of the curb. Clamps, spreaders, and braces shall be used where required to ensure rigidity in the forms.
- 3.2.2 Concrete Placement and Finishing: Concrete shall be placed in layers not to exceed 6 inches. Concrete shall be thoroughly consolidated. The edges of the gutter and top of the curb shall be rounded with an edging tool to a radius of 1/2 inch, and the surfaces shall be floated and finished with a smooth wood float until true to grade and section and uniform in texture. Floated surfaces shall then be brushed with longitudinal strokes. Immediately after removing the front curb form, the face of the curb shall be rubbed. The surface shall be brushed in the same manner as the gutter and curb top. The top surface of gutter and entrance shall be finished to grade with a wood float. Expansion joints and contraction joints shall be constructed at right angles to the line of curb and gutter. Contraction joints shall be constructed by means of 1/8-inch thick separators, of a section conforming to the cross section of the curb and gutter. Contraction joints shall match joints in abutting Portland cement concrete pavement. At other pavements, construction joints shall be placed at not less than 5 feet nor greater than 15 feet apart. Expansion joints shall be formed by means of preformed expansion joint filler material cut and shaped to the cross section of curb and gutter. Expansion joints shall be provided in curb at the end of all returns. Expansion Joints shall match expansion joints of abutting Portland cement concrete pavement. At other pavements, expansion joints at least 1/2 inch in width shall be provided at intervals not exceeding 45 feet. Exposed concrete surfaces shall be cured for not less than 7 days.
- 3.2.3 Backfilling: After curing, debris shall be removed, and the area adjoining the concrete shall be backfilled, graded, and compacted.
- 3.2.4 Sealing Joints: Expansion joints and the top 1-inch depth of contraction joints shall be sealed with joint sealer. The joint opening shall be thoroughly cleaned before the sealing material is placed. Excess material on exposed surfaces of the concrete shall be removed immediately and exposed concrete surfaces cleaned.

END OF SECTION 02620a



## 02000 - Site Work

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### SECTION 02620b

#### STEEL CURBS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of steel curbs. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
  - 2.1 STANDARD STEEL CURB SECTIONS- Noncorrosive steel sections as required to match existing.
  - 2.2 COATING- Steel curb sections shall be zinc coated.
  - 2.3 Joint Materials:
    - 2.3.1 Expansion Joint Fillers: ASTM D 1751 or ASTM D 1752.
    - 2.3.2 Joint Sealers: ASTM D 1850.
  - 2.4 Concrete: Concrete shall have a minimum compressive strength of 3,000 psi. The maximum size of aggregate shall be 1-1/2 inches. Concrete shall have a slump of not more than 3 inches and an air content by volume of concrete of 3 to 6 percent.
- 3.0 EXECUTION:
  - 3.1 Preparation: The subgrade shall be constructed to grade and cross section. The subgrade shall be of materials equal in bearing quality to the subgrade under the adjacent pavement and shall be compacted. The subgrade shall be maintained in a smooth, compacted condition, in conformity with the required section and established grade until the concrete is placed. The subgrade shall be in a moist condition when concrete is placed.
  - 3.2 Installation:
    - 3.2.1 Steel Curb Setting: Steel curbs shall be carefully set to alignment and grade and to conform to the dimensions of the curb.
    - 3.2.2 Concrete Placement And Finishing: Concrete shall be placed in layers not to exceed 6 inches. Concrete shall be thoroughly consolidated. Floated surfaces shall then be brushed with longitudinal strokes. The top surface of the entrance shall be finished to grade with a wood float. Expansion joints and contraction joints shall be constructed at right angles to the line of curb. Contraction joints shall be constructed by means of 1/8-inch thick separators, of a section conforming to the cross section of the curb and gutter. Contraction joints shall match joints in abutting Portland cement concrete pavement. At other pavements, construction joints shall be placed at not less than 5 feet nor greater than 15 feet apart. Expansion joints shall be formed by means of preformed expansion joint filler material cut and shaped to the cross section of curb. Expansion joints shall be provided in a curb at the end of all returns. Expansion joints shall match expansion joints of abutting Portland cement



## 02000 - Site Work

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concrete pavement. At other pavements, expansion joints at least 1/2 inch in width shall be provided at intervals not exceeding 45 feet. Exposed concrete surfaces shall be cured for not less than 7 days.

- 3.2.3 Backfilling: After curing, debris shall be removed, and the area adjoining the concrete shall be backfilled, graded, and compacted.
- 3.2.4 Sealing Joints: Expansion joints and the top 1-inch depth of contraction joints shall be sealed with joint sealer. The joint opening shall be thoroughly cleaned before the sealing material is placed. Excess material on exposed surfaces of the concrete shall be removed immediately and exposed concrete surfaces cleaned.

END OF SECTION 02620b



## 02000 - Site Work

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### SECTION 02620c

#### GRANITE CURBS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of Granite curbs . Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCT:
  - 2.1 Exposed Aggregate or Granite: ASTM C 615 and National Building Granite Quarries Association, Inc.
  - 2.2 Exposed Limestone: Limestone (Oolitic), ASTM C 568, Category II
  - 2.3 Mortar and Grout:
    - 2.3.1 Portland Cement: ASTM C 150 and the staining requirements of ASTM C 91.
    - 2.3.2 Masonry Cement: ASTM C 91, non-staining.
    - 2.3.3 Hydrated Lime: ASTM C 207, Type S.
    - 2.3.4 Sand: ASTM C 144.
      - 2.3.4.1 White Pointing Mortar: Natural white sand or ground white stone.
      - 2.3.4.2 Colored Pointing Mortar: Marble, granite, or sound stone.
  - 2.4 Joint Materials:
    - 2.4.1 Expansion Joint Fillers: ASTM D 1751 or ASTM D 1752.
    - 2.4.2 Joint Sealers: ASTM D 1850.
- 3.0 EXECUTION:
  - 3.1 Preparation:
    - 3.1.1 Clean Stone with clear water.
    - 3.1.2 Ferrous Metal: Apply a heavy coat of bituminous paint on metal surfaces in contact with block.
  - 3.2 Installation:
    - 3.2.1 Expansion Joints: Install continuous strips of preformed joint filler.
    - 3.2.2 Clean Subbase and saturate with clean water.
    - 3.2.3 Slush Coat: Apply 1/16-inch thick slush coat of cement grout over concrete subbase about 15 minutes prior to placing setting bed.



- 3.2.4 Setting Bed: Mix one 94-pound bag of cement to 3 cu ft of sand. Use only enough water to produce a moist surface when setting bed is ready for setting of stone. Spread and screed to a uniform thickness.
- 3.2.5 Set Stone or Concrete Block before initial set of cement bed occurs. Wet Stone or block thoroughly before setting. Apply a thin layer of neat cement paste 1/32-inch to 1/16-inch thick to setting bed, or bottom of stone or block.
- 3.2.6 Grout joints as soon as possible after initial set of setting bed and tool slightly concave. Use grout mix of one bag Portland cement to 2 cu ft sand. Cure grout by maintaining in a moist condition for 7 days. Do not permit traffic on surface during setting of units or for at least 24 hours after final grouting of joints.

END OF SECTION 02620c





## SECTION 02630a

### PORTLAND CEMENT CONCRETE SIDEWALKS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of Portland cement concrete (PCC) sidewalks. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
  - 2.1 Ready-Mixed Concrete: Ready-mixed concrete shall comply with ASTM C 94, Alternate No. 2. The concrete shall have a slump of not more than three inches. The concrete shall attain a minimum compressive strength of 3,000 psi at 28 days.
  - 2.2 Aggregates: ASTM C 33.
  - 2.3 Reinforcement Steel: Wire mesh reinforcement shall comply with ASTM A 184.
  - 2.4 Expansion Joint Fillers: Expansion joint fillers shall comply with ASTM D 1751 or D 1752 or shall be resin impregnated fiberboard complying with ASTM D 1752. One filler shall be installed every six feet of running concrete.
  - 2.5 Joint Sealers: ASTM D 1850.
- 3.0 EXECUTION:
  - 3.1 Reinforcement Steel: Fasten reinforcement steel accurately and securely in place with suitable supports and ties before the concrete is placed.
  - 3.2 Concrete Conveying: Convey concrete to construction areas by methods that will prevent segregation.
  - 3.3 Concrete Placing: Moisten the subgrade just before the concrete is placed. Place concrete in one layer of such thickness that when compacted and finished the sidewalk will be of the required thickness.
  - 3.4 Edge and Joint Finishing: Carefully finish all slab edges, including those at formed joints, with an edge having a radius of 1/8 inch.
  - 3.5 Contraction Joints: Divide the concrete surface into rectangular areas by means of contraction Joints: Form expansion joints about structures and features that project through or into the sidewalk pavement. Fill expansion joints with joint filler of the type, thickness, and width to match existing or as directed by the Contracting Officer. Place the joint filler with the top edge 1/4 inch below the surface. Remove concrete over the joint filler.
  - 3.7 Joint Sealing: At the end of the curing period, carefully clean and seal expansion joints.
  - 3.8 Portland Cement Concrete Curing: Cure new concrete by protection against loss of moisture and rapid temperature changes for a period of not less than 7 days.



3.9        Backfilling: After curing, remove debris adjoining the sidewalk, backfill, grade, and compact to conform to the surrounding area.

3.10       Dusting: No dusting shall be allowed.

END OF SECTION 02630a



## SECTION 02630b

### ASPHALT CONCRETE SIDEWALKS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of asphalt concrete sidewalks. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
  - 2.1 Asphaltic Concrete:
    - 2.1.1 Hot-Mixed, Hot-Laid Bituminous Paving Mixtures: ASTM D 3515.
    - 2.1.2 Plant-Mixed, Stockpiled Asphalt Cold Mixes: Asphalt Institute Manual MS-14.
  - 2.2 Bituminous Prime: ASTM D 2027, Grades MC-30 or MC-70; ASTM D 2028, Grade RC-70; or ASTM D 2026, Grade SC-70.
  - 2.3 Base Course: ASTM D 2940,
  - 2.4 Bituminous Tack Coat: ASTM D 977, Grades RS-I, MS-I or SS-Ih; ASTM D 2027, Grade MC-30; ASTM D 2028, Grade RC-70; ASTM D 2026, Grade SC-70; or ASTM D 2397, Grades CRS-I or CSS-I.
  - 2.5 Seal Coat: ASTM D 2027, Grade HC-250 or MC-800; or D 2028, Grade RC-250 or RC-800.
  - 2.6 Slurry Coat Mixture shall be comprised of 70 percent sand or fine aggregate, 10 percent water, and 20 percent liquid or emulsified asphalt.
    - 2.6.1 Fine Aggregate: ASTM D 1073, Grade 2.
    - 2.6.2 Emulsified Asphalt: ASTM D 977, Grades SS-I or SS-Ih.
- 3.0 EXECUTION:
  - 3.1 Application Temperatures: Application temperatures for all asphalt materials shall comply with provisions of the Asphalt Institute publications and the applicable ASTMs.
  - 3.2 Subgrade: Construct the subgrade for walkway replacement true to grade and compact as required.
  - 3.3 Base Course:
    - 3.3.1 Placing: Spread the base course material evenly upon the prepared subgrade, in a layer of such depth that when compacted the layer will be uniform and of the thickness required.
    - 3.3.2 Compaction: Immediately following the spreading of the material, compact the base course with equipment to a density as required.
  - 3.4 Surface Course:



- 3.4.1 Placing: Apply prime coat, and allow it to cure. The placing of the mixture shall be continuous. Paint all contact surfaces of previously constructed sidewalk with a tack coat of rapid-setting liquid asphalt just before the fresh mixture is placed.
- 3.4.2 Forms: Set forms with the upper edge true to line and hold grade rigidly in place by stakes placed on the outside of the forms and set flush with the top edge of the forms.
- 3.4.3 Compaction: Immediately following the placement of the asphalt concrete mixture, compact the surface course with equipment to a density as required.
- 3.4.4 Backfilling: After removing the forms and debris, backfill the exposed or excavated area adjoining the sidewalk with granular material, grade, and compact to conform to the surrounding area.
- 3.5 Patching:
  - 3.5.1 For Repair Operations Involving Raveling, Heaving, Spalling, and Alligating: Cut asphalt concrete paving back to solid material, making cut area rectangular with vertical sides. Remove deteriorated pavement including base material if required. Replace base course, compact, and tack coat the base material and the vertical surfaces of cut area. Fill area with new asphalt concrete and compact level with existing walkway. Dust patched area with sand or mineral dust.
  - 3.5.2 Pothole Repair: Cut rectangular hole around pothole back to solid pavement leaving straight, vertical edges. Remove loose material and water to firm base. Fill holes and compact to within 3 inches of the surface in layers not exceeding 6 inches with either base material or asphalt mixture. Apply tack coat to base material and vertical edges. On the surface layer, fill with asphalt mixture and mound to such height that when compacted the mix will be level with surrounding walkway surface. Dust patched area with sand or mineral dust.
  - 3.5.3 Low Spot or Depression Repair: Determine limits of depression with straightedge, and mark outline with crayon. Apply tack coat, 0.05 to 0.15 gallon per square yard, to the cleaned area, and allow to cure. Spread area with asphalt concrete mix and feather edge by raking and manipulation of the material. Roll and compact area to surrounding walkway level. Recheck with straightedge. Apply a sand seal to the patched area to prevent entrance of water.
  - 3.5.4 Polished Aggregate Repair: Clean and dry area thoroughly. Apply tack coat at a rate of 0.05 to 0.15 gallon per square yard; overlay area with new asphalt concrete mix to a minimum 1-1/2 inch thickness and feather to adjoining walkway surfaces. Roll with pneumatic or steel rollers.
  - 3.5.5 Damaged Edging Repair: Remove damaged or deteriorated edging materials and replace.
  - 3.5.6 Prime Coat: Prime new base course with MC-70 liquid asphalt at a rate of 0.20 to 0.30 gallon per square yard. Take care to apply to more asphalt than will penetrate into the base course during curing. Blot excess prime with sand before the surfacing material is applied.
  - 3.5.7 Tack Coat: Surfaces and cut edges of existing asphalt concrete shall be given a tack coat of MC-70 liquid asphalt at a rate of 0.05 to 0.15 gallon per square yard. After application of the tack coat, allow time for the material to cure before surfacing and patching material is placed.
  - 3.5.8 Seal Coat Spray Application: Walkway surfaces that are to be sealed shall receive a liquid asphalt coat applied at a rate of 0.15 to 0.20 gallon per square yard, along with a fine aggregate at a rate of 15 to 20 pounds per square yard.



## 02000 - Site Work

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- 3.6 Crack Repair: Fill cracks after drying with liquid asphalt, sand asphalt emulsion water mixture, or slurry seal. After thorough cleaning, work the mixture into cracks by broom or squeegee. Cracks 1/8 to 1/2 inch width shall be slurry sealed and filled with liquid asphalt. Dust repaired cracks with fine aggregate or mineral dust to prevent cracking. Final thickness of the slurry seal shall be 1/8 inch minimum.

END OF SECTION 02630b



## SECTION 02630c

### MISCELLANEOUS SIDEWALKS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of gravel, masonry, and wood sidewalks. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
  - 2.1 Aggregate shall comply with the following:
    - 2.1.1 Surface Course Aggregates shall be well-graded, crushed stone, 3/4- to 1-1/4 inch size, consisting of clean, sound, durable particles.
    - 2.1.2 Masonry Grout Aggregate: ASTM C 404, Size 2. .
  - 2.2 Base Course: Base course material shall be a granular dense-graded, high-quality compactible material.
  - 2.3 Ready-Mixed Concrete: Ready-mixed concrete shall comply with ASTM C 94. The concrete shall attain a minimum compressive strength of 3,000 psi at 28 days.
  - 2.4 Portland Cement Concrete: Cement shall comply with ASTM C 150.
  - 2.5 Joint Filler: Masonry joint filler shall be Portland cement concrete mix with cement complying with ASTM C 150.
  - 2.6 Masonry Units: Color and texture shall match the existing as nearly as is practicable.
  - 2.7 Wood and Preservatives: Footboards and supports shall be 1-1/2 inch thick Number 1 dense Douglas fir or yellow pine lumber, pressure-treated with chromated copper arsenate (CCA) preservative complying with applicable ASTM Standards. Retention shall be a minimum of 0.25 pounds per cubic foot.
- 3.0 EXECUTION:
  - 3.1 Base Course Repair: Remove material in soft spots to such depth required to provide a firm foundation for surface materials and fill with granular material of a quality that will compact when moistened. Roll or tamp this material to obtain the proper density.
  - 3.2 Surface Repair:
    - 3.2.1 Aggregate Walkways: Spread the surface material evenly on the base course in a layer of such depth that when compacted, the layer will be uniform with a minimum thickness of 4 inches.
    - 3.2.2 Joint Filling: Completely remove and clean the joint of all loose joint material, dirt, clay, or other foreign matter. Fill the joint flush with concrete to provide a uniform surface.



## 02000 - Site Work

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- 3.2.3 Wood Walkways: Secure wood members with galvanized nails, screws, bolts, or other approved fasteners to ensure tight joints.
- 3.2.4 Masonry Walkways: New or salvaged masonry units will be placed on a 3/4-inch mortar setting bed with mortar joints matching the existing walkway. Place the setting bed on a fresh 3-inch thick Portland cement concrete slab.

END OF SECTION 02630c



## SECTION 02630d

### PRECAST SIDEWALKS AND PAVERS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of precast sidewalks and pavers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
  - 2.1 Precast Concrete Patio Blocks: ASTM C-936. Natural or colored, Minimum 2 inches thick.
  - 2.2 Exposed Aggregate or Granite: ASTM C 615 and National Building Granite Quarries Association, Inc.
    - 2.2.1 Exposed Limestone: Limestone (Oolitic), ASTM C 568, Category II.
    - 2.2.2 Exposed White Tumblestone Aggregate: As directed.
  - 2.3 Stone Pavers:
    - 2.3.1 Bluestone Flagging Paver: Irregular cut, 1 inch thick.
    - 2.3.2 White Marble, Crushed Stone: ASTM C 503 and Marble Institute of America (MIA), 3 inches thick.
    - 2.3.3 Bluestone, Crushed Stone: 3 inches thick.
    - 2.3.4 Natural Cleft Slate: ASTM C 629, 3/4-inch irregular cut, 1/2-inch random rectangular cut, or 1/4-inch random rectangular butted joints.
  - 2.4 Granite Blocks: Blocks shall be 3 to 5 inches thick and comply with requirements of ASTM C 615 and National Building Granite Quarries Association, Inc. Sizes shall be 3-1/2 inches square; 4 to 12 inches by 3 to 5 inches; and 6 to 15 inches by 3 to 6 inches.
  - 2.5 Mortar and Grout:
    - 2.5.1 Portland Cement: ASTM C 150 and the staining requirements of ASTM C 91.
    - 2.5.2 Masonry Cement: ASTM C 91, non-staining.
    - 2.5.3 Hydrated Lime: ASTM C 207, Type S.
    - 2.5.4 Sand: ASTM C 144.
      - 2.5.4.1 White Pointing Mortar: Natural white sand or ground white stone.
      - 2.5.4.2 Colored Pointing Mortar: Marble, granite, or sound stone.
- 3.0 EXECUTION:
  - 3.1 Preparation:
    - 3.1.1 Clean Stone or Concrete Block with clear water.





## 02000 - Site Work

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- 3.1.2 Ferrous Metal: Apply a heavy coat of bituminous paint on metal surfaces in contact with block.
- 3.2 Installation:
  - 3.2.1 Expansion Joints: Install continuous strips of preformed joint filler.
  - 3.2.2 Clean Subbase and saturate with clean water.
  - 3.2.3 Slush Coat: Apply 1/16-inch thick slush coat of cement grout over concrete subbase about 15 minutes prior to placing setting bed.
  - 3.2.4 Setting Bed: Mix one 94-pound bag of cement to 3 cu ft of sand. Use only enough water to produce a moist surface when setting bed is ready for setting of stone. Spread and screed to a uniform thickness.
  - 3.2.5 Set Stone or Concrete Block before initial set of cement bed occurs. Wet stone or block thoroughly before setting. Apply a thin layer of neat cement paste 1/32-inch to 1/16-inch thick to setting bed, or bottom of stone or block.
  - 3.2.6 Grout joints as soon as possible after initial set of setting bed and tool slightly concave. Use grout mix of one bag Portland cement to 2 cu ft sand. Cure grout by maintaining in a moist condition for 7 days. Do not permit traffic on surface during setting of units or for at least 24 hours after final grouting of joints.

END OF SECTION 02630d



## SECTION 02630e

### PRECAST INTERLOCKING PAVERS

- 1.01 DESCRIPTION: This specification covers the furnishing and installation of materials for interlocking precast pavers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.01 JOB CONDITIONS
- A. Protect adjoining work before work of this Section begins.
  - B. Substrate shall be firm, compacted, clean, and free from oil, curing compounds, grease, dirt, and waxy film.
  - C. Grounds, anchors, plugs, hangers, electrical work, and mechanical work in area to be paved shall be installed, tested, and accepted.
  - D. When measured in every direction, concrete substrate shall deviate not more than 3/16 inch from ten-foot straightedge.
- 1.02 STORAGE AND HANDLING
- A. Stockpile and handle setting sand to prevent contamination.
  - B. Store pavers off ground and cover; prevent staining and contamination.
- 1.03 SPARES: Deliver extra pavers in a quantity not less than two percent of total amount of each kind, grade, and color of pavers installed.
- 2.0 PRODUCTS
- 2.01 PAVERS: Precast concrete, nonslip, as-cast (sandblasted) surface texture; conform to ASTM C936, compressive strength 8000 psi avg minimum; absorption less than 5 percent (ASTM C140); thickness 2 3/8 (3 1/8) inches; shape and color shall be determined by the Contracting Officer. Acceptable manufacturer: Paver Systems, Lithonia, GA or approved equivalent.
- 2.02 SETTING SAND: Manufactured or natural graded, washed, sharp sand 100 percent passing 3/8 sieve; maximum of 3 percent passing #200 sieve.
- 2.03 EDGE RESTRAINT: One of the following:
- A. Paver manufacturer's precast curb
  - B. Concrete curb
  - C. Building wall
- 2.04 JOINT FILLER: " closed cell , polyethylene foam, top 1/2" skip-scored for removal, one side coated with pressure sensitive adhesive. Acceptable manufacturers:



## 02000 - Site Work

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- A. W.R.Meadows, Ceramar.
  - B. Sonneborn Building Products, Chemrex Inc., Sonoflex F.
  - C. Progress Unlimited Inc., Skip Slit Joint Filler.
- 2.05 SEALANT: See SEALANTS.
- 2.06 MEMBRANE WATERPROOFING: Section MEMBRANE WATERPROOFING.
- 2.07 PAVER SEALER: Acrylic resin concrete sealer, as recommended by paver manufacturer.
- 2.08 DRAINAGE MAT: Drainage system composite consisting of non-woven, needle punched filter fabric bonded to one side of a crush-proof drainage core; ASTM D4439.
- 3.0 EXECUTION
- 3.01 EXAMINATION: Examine substrate for defects adversely affecting work and for excess in allowable tolerances, before installation.
- 3.02 PREPARATION
- A. Base course: Prepare and compact. Surface of base course shall be 3 1/8 inches below finished surface of paving for 2 3/8 pavers (3 7/8 inches for 3 1/8 pavers) with less than 1/4 tolerance.
  - B. Concrete surface: Clean substrate; install waterproofing membrane (and protection board), and drainage mat in accordance with manufacturers printed instructions.
  - C. Edge restraint: Construct in accordance with the appropriate specification section and to tolerances and levels indicated.
  - D. Sand setting bed: Spread and screed sand to produce one inch thick laying course; do not disturb screeded bed before placing pavers.
- 3.03 INSTALLATION
- A. Discard pavers with chips, cracks, discoloration, and other visible defects.
  - B. Cut units with saws designed to cleanly cut pavers. Cut unit edges shall be clean, sharp, and unchipped. Fit pavers neatly to adjoining work and in indicated pattern. Use uncut pavers wherever possible, use no pieces smaller than one-half full size.
  - C. Install filler in indicated joints extending thru setting bed.
  - D. Vibrate laid pavers with flat-faced vibrator capable of producing 3000 to 5000 pounds compaction force.
  - E. Spread clean, dry sand over vibrated surfaces; re-vibrate and sweep until joints between pavers are filled.
  - F. Form isolation joints where indicated. Construct joints completely through pavers and setting bed. Unless otherwise indicated, joint shall be 3/8 inch wide.
  - G. Tolerances
    - 1. Width of joints: Vary not more than 1/16 inch.



2. Flatness of installed pavers: Vary not more than 1/16 inch from a ten-foot straightedge.
3. Elevation over edge restraints: Not more than plus 1/8 inch.

3.04 CLEANING

- A. Remove construction debris; clean discolored paver faces in accordance with coating manufacturer's printed instructions; do not use acid.
- B. Sweep off excess extruded sand.

3.05 ISOLATION JOINTS: Remove top part of joint filler and clean joint faces.

3.06 SEALANTS: Install as specified in SEALANTS.

3.07 SEALER: Install in accordance with paver manufacturers' printed instructions.

END OF SECTION 02630e



## SECTION 02710a

### WROUGHT IRON ROD AND BAR FENCING

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishings and installation of wrought iron rod and bar fencing including ornamental malleable iron fencing. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.1 Shop drawings shall be submitted for approval.
- 2.0 PRODUCTS :
- 2.1 Pickets shall be 3/8-inch square wrought iron rods of the required length and configuration.
- 2.2 Gates: Hardware shall be compatible with existing hardware in appearance and function. "
- 2.3 Accessories:
- 2.3.1 Brackets: Brackets for fastening fencing to walls, floor, posts, and other attachments shall be wrought iron.
- 2.3.2 Trim: Provide iron trim items as required.
- 2.3.3 Bolts and Nuts shall be ASTM A 307 and galvanized in compliance with ASTM A 153.
- 3.0 EXECUTION:
- 3.1 Pickets shall be welded to rails. Welding shall comply with AWS B3.0 and shall seal the joint against moisture.
- 3.2 Rails shall be securely fastened to posts with angle brackets.
- 3.3 Posts shall be set in sleeves or footings to match existing conditions. Posts set in sleeves shall have the annular space between the sleeve and post filled with lead.
- 3.4 Brackets for wall mounting and change of grade shall be securely fastened to wall and/or posts with appropriate fasteners.
- 3.5 Gates:
- 3.5.1 Frame: Iron rod and bar rails and pickets shall be welded with full welds into sections in a pattern matching existing fencing.
- 3.5.2 Rail-and-picket sections shall be fastened to posts with angle brackets, bolts, and nuts.
- 3.5.3 Bracing: Iron rod or bar braces shall be welded in place when required to strengthen the gate.

END OF SECTION 02710a



## SECTION 02710b

### SNOW AND OTHER TEMPORARY FENCING

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of snow and other temporary fencing. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Pickets:
- 2.1.1. Size: Wood pickets shall be 3/8 inch thick, 1-1/2 inches wide, and 48 inches high.
- 2.1.2. Coating: Red oil paint or stain.
- 2.1.3. Spacing: Approximately two inches apart.
- 2.1.4. Attachment: Bind together with three double strands of wire.
- 2.2 Framework:
- 2.2.1 Materials: Wire shall be 13 gauge galvanized steel, complying with ASTM A 641.
- 2.2.2 Types: The framework shall consist of three parallel double strands of wire twisted between pickets to hold them securely in place.
- 2.2.3 Wire Connectors: Wire for attaching fabric to metal posts shall be nine gauge.
- 2.2.4 Staples and Nails shall comply with Fed. Spec. FF-N-105. Staples and nails shall be zinc-coated and of sufficient length for purpose required.
- 2.3 Gates:
- 2.3.1 Frame: Frame shall consist of two parallel horizontal wooden members with pickets attached at two-inch spacing.
- 2.3.2 Bracing: Two wooden members laced diagonally on the gate between the frame boards.
- 2.3.3 Hardware shall include two strap hinges, latching device, and stop bar, all of zinc-coated steel, in compliance with ASTM A 153.
- 2.4 Supports:
- 2.4.1 Steel: Line posts and uprights shall be drive type, T sections, and provided with suitable anchor plate. The sections shall be hot-rolled steel complying with ASTM A 702, galvanized in compliance with ASTM A 123. The T sections shall have the following minimum sizes:
- | Post Length (Feet) | Post Weight (Pounds) |
|--------------------|----------------------|
| 5                  | 7.32                 |
| 5 1/2              | 7.99                 |



## 02000 - Site Work

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6	8.65
6 1/2	9.32
7	9.98
7 1/2	10.64
8	11.31
9	12.64
10	13.97

- 2.4.2 Wood: Posts shall be cut from cedar, Douglas fir, pine, or other approved species of timber. Posts shall be peeled, treated, dressed, and cured. All wood posts and braces shall be given a pressure preservative treatment in a closed retort. The treatment shall comply with Fed. Spec. TT.W-571. Wood cut or sawed after treatment shall have the cut surfaces well brush-coated with the preservative used in the treatment.
- 2.4.3 Braces: Steel braces shall have same configuration as line posts and uprights without the anchor plate. Wood braces shall be treated No. 2 or better grade, Douglas fir or southern yellow pine. Braces shall meet all of the requirements for wood posts.
- 2.4.4 Location: Posts shall be evenly spaced to adequately support the fence framework.
- 3.0 EXECUTION:
- 3.1 Wood Posts: Hold in line in a true vertical position by temporary bracing until backfilling is completed. Compact by hand tamping or other suitable methods to a density comparable to that of adjacent ground.
- 3.2 Steel Posts: Hold in a vertical position and drive to the required depths by an approved post driver. Post tops shall not be damaged during driving.
- 3.3 Corner, Brace, Or End Panels: Construct corner, brace, or end panels at the beginning and terminal ends, at gate openings, at all intersections, and at all corners or changes in horizontal alignment of fences, in existing fence on both sides of junction with new fence (except when junction is at a corner already braced).
- 3.4 Pull Posts shall be constructed when the distance of unbraced fencing exceeds 640 feet. Pull posts shall be spaced equidistant in the fence at intervals of 640 feet or less.
- 3.5 Framework Installation: Stretch to proper tension and securely fasten to posts. Top and bottom wires of fabric shall be tied or stapled to each post. Tie or staple every other wire to alternating posts. Every wire shall be tied or stapled to corner, pull, end, and gate posts. Wire for tied fabrics shall be nine gauge.
- 3.6 Picket Replacement: Where required, new pickets shall be securely fastened into the existing wire framework using 13 gauge galvanized wire.
- 3.7 Restretching Existing Fabric: Fabric designated to be restretched shall be restretched to proper tension and refastened to posts. Excess fabric extending beyond the post shall be removed.

END OF SECTION 02710b



## SECTION 02711a

### FENCES AND GATES

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of fences and gates. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.1 Shop drawings shall be submitted for approval.
- 2.0 PRODUCTS:
  - 2.1 Ground Rods, Down Conductors, and Connectors:
    - 2.1.1 Ground Rods: Galvanized steel rods, 3/4 inch in diameter by 10 feet in length.
    - 2.1.2 Down Conductors: No. 8 copper wire or equivalent.
    - 2.1.3 Connectors: Pressure type bolted or compression type.
  - 2.2 Foundations shall be concrete with a minimum 28-day strength of 3,000 psi, and shall extend from 3 feet 6 inches below finished grade to 2 inches above finished grade. Tops of foundations shall slope away from posts. Extend gate post foundations to the underside of the bottom hinge. Foundations for line posts shall be 10 inches in diameter. Foundations for terminal and gate posts shall be the diameter of the post plus 8 inches but not less than 12 inches.
- 3.0 EXECUTION:
  - 3.1 Existing Fence Connections: Wherever new fencing joins an existing fence, either at a corner or at the intersection of straight line fences, a corner post with brace post shall be set at the junction and braced. If the connection is made elsewhere than the corner of the fencing, the last span of the existing fence shall contain a brace span.
  - 3.2 Security Fence: Wherever existing fencing fabric is embedded in concrete or earth, or attached to an earth-embedded galvanized steel sheet, repairs shall be made as follows:
    - 3.2.1 Earth Embedment: Install new fabric or galvanized steel sheet to depth of existing. Attach steel sheet securely to adjacent existing sheeting and new and existing fencing fabric. Thoroughly backfill and compact soil in repair area.
    - 3.2.2 Concrete Embedment: Install fence fabric to the depth of existing fabric. Place concrete to match existing configuration. Clean all exposed fencing of concrete that is a result of new construction.
  - 3.3 Gate Installation: Install, plumb, level, and secure for full opening without interference. Install ground-set items in concrete for anchorage, as recommended by the fence manufacturer. Install and adjust hardware for smooth operation and lubricate where necessary.
  - 3.4 Grounding: Ground on each side of every gate where crossed by high-tension-line crossings, at 1,000 to 1,500 foot intervals along fence in isolated areas, and at 500 to 750 foot intervals when in





## 02000 - Site Work

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close proximity (100 feet or less) to public roads, highways, and buildings. Down conductors shall run full height of fence wherever wood posts are used and shall be securely fastened to each strand of wire to provide electrical continuity.

- 3.5 Field Painting: At the completion of repair work, touch up all surfaces damaged by construction operations. Galvanized surfaces shall be painted with zinc-oxide paint. Wood, steel, vinyl coated, aluminized, and other fencing materials shall be touched up following the manufacturer's recommendations or to match existing finish.
- 3.6 Final Grading: The final ground surface shall be graded to remove irregularities and maintain the clearance between the bottom of the fence and the ground surface.
- 3.7 Seeding and Sodding: Seed or sod all lawn areas disturbed by repair and maintenance operations with a plant variety of the same species as that in adjacent areas. Areas where grass does not take hold shall be reseeded or resodded as directed by the Contracting Officer.

END OF SECTION 02710



## SECTION 02711b

### STEEL CHAIN-LINK FENCING

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of steel chain- link fencing. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.1 Submittals
- 1.1.1 Shop Drawings:  
Furnish complete layout of fences, giving post spacing, etc., for approval prior to erection.
- 1.1.2 Samples: Posts, rails, tie wire, wire fabric, fittings, etc., for approval prior to erection.
- 2.0 PRODUCTS:
- 2.1 Material:
- 2.1.1 Fences shall have a framework consisting of uprights and horizontal members of standard weight steel pipe or other approved malleable cast iron or pressed steel fittings not less than 3/16 inch thick and 3/8 inch diameter bolts.
- 2.1.2 Framework shall be set plumb with the uprights set in sockets formed in the walls or piers and grouted in with cement, the sockets being completely filled and the cement neatly finished flush with the surface of the walls, or as otherwise indicated.
- 2.1.3 Uprights shall be spaced not more than 10 feet on center, and rails set at the various heights shown.
- 2.1.4 Set posts to depth of 3 inches above the bottom of the concrete foundation.
- 2.1.5 Where gates occur additional rails and diagonal tie rods having turnbuckle tighteners shall be inserted between the gate posts and the fence posts.
- 2.1.6 Fencing shall be of chain link woven steel wire, of gage and mesh size shown on detail drawings, and shall be secured to the framework with aluminum wire on top of fence telegraphed spliced (with no less than three turns) around fence fabric.
- 2.1.7 Bottom of fence shall be secured to framework with #9 ga. galvanized steel clips as indicated.
- 2.1.8 Aluminum wire shall be of the same diameter as fence fabric, spaced 14 inches on centers on posts and 24 inches on centers on rails.
- 2.1.9 The wire fabric of fences shall be knuckled at the top and bottom.
- 2.2 Galvanizing:
- 2.2.1 All posts, rails, fittings, etc., shall be hot dipped galvanized.



## 02000 - Site Work

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- 2.2.2 Wire fabric shall be hot dipped galvanized after weaving in accordance with ASTM A392 Class II, weighing 1.8 oz. per square foot of wire surface; pressed steel fittings and malleable cast iron fittings shall be hot dipped galvanized in accordance with ASTM A123 for pressed steel and ASTM A338 for malleable cast iron fittings, weighing 1.8 oz. per square foot of fitting surface.
- 2.2.3 One ounce of zinc coating per square foot of surface is equal to a coating thickness of 0.0015 inches. (ASTM A123).
- 2.3 Wire Gates
- 2.3.1 Gates shall be furnished and erected where shown.
- 2.3.2 Constructed of same material as the fences and all members shall be securely put together as indicated on drawings.
- 2.3.3 Treaded, slip fittings or welded frame for the construction of the gates as indicated on details is an option.
- 2.3.4 All gates shall be braced with trues rods and turnbuckles as indicated.
- 2.4 Padlocks:
- 2.4.1 Furnish padlocks for new gates where indicated. Locks to be set up alike: Furnish five (5) keys for all.
- 2.4.2 Padlock case shall be of 1 3/4 inch extruded brass, cornered elliptical shape. The width of the case shall be 1 3/4 inches, the depth 1-19/32 inches and the thickness 13/16 inches. The shackle shall be of hardened steel cadmium plated with a diameter of 11/31 inches. The width of the opening of shackle from the top of the case to the inside of the shackle shall be 29/32 inches. The shackle shall lock at both the toe and the heel.
- 2.4.3 Cylinder shall be capable of being keyed individually, keyed alike, master keyed and sets and grandmaster keyed as will be directed.
- 2.4.4 Padlocks shall have 14 gauge steel wire chains 9 inches long attached to lock and riveting pins with rivets and clevis. Chains, rivets, clevis and riveting pins shall be hot dipped galvanized or cadmium plated. Chains shall be galvanized after fabrication.
- 2.4.5 All padlocks shall have manufacturer's name and the words, "Property of the Corpus Christi Army Depot" stamped or cast on same.
- 2.4.6 Certification: If requested by the Contracting Officer, furnish a certification by a testing laboratory approved by the Contracting Officer, stating that fencing materials installed comply with the requirements of ASTM specifications referred to herein.
- 2.2 Pipe Sleeves: Furnish 16-gauge galvanized iron pipe sleeve of required diameter and length for setting in concrete fence post footings.
- 3.0 EXECUTION:
- 3.1 Erection: Check each post for vertical and top alignment and hold in position during placement and finishing operations.
- 3.2 Touching-Up: After erection and installation are complete, touch-up damaged portions during transportation and erection using same finish to match.



END OF SECTION 02711b



## SECTION 02713

### PERMANENT WOOD FENCING

- 1.0 DESCRIPTION OF WORK: The specification covers the furnishing and installation of materials for repair and maintenance of permanent wood fencing. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
  - 2.1 Pickets:
    - 2.1.1 Size: Wood For picket shall match the existing fencing in material, configuration, dimensions, texture, and finishes,
    - 2.1.2 Attachment: Hot-dipped galvanized nails complying with Fed. Spec. FF-N-105 shall be used to fasten pickets to rails.
  - 2.2 Framework:
    - 2.2.1 Line Posts: 4 x 4 of required length to match existing post height and extend into the ground as required to assure rigid installation.
    - 2.2.2 Terminal and Corner Posts: 4 x 4 of required length.
    - 2.2.3 Gate Posts: 4 x 6 and of the length required for firm embedment to resist gate action.
    - 2.2.4 Top Rail: 2 x 4 of length required to span between posts.
    - 2.2.5 Where Bracing is Required, it shall match top and bottom rails in dimension and finish.
    - 2.2.6 Metal Posts and Rails: Solid mild steel galvanized in compliance with ASTM A 123- of the length and style required to match existing.
  - 2.3 Gates:
    - 2.3.1 Frame: 2 x 4 members with attached pickets. Configuration of gate shall match that of existing gates.
    - 2.3.2 Bracing: Single 2 x 4 running diagonally across the gate to opposite corners of the frame.
    - 2.3.3 Hardware: Hinges, latches, and other hardware shall be hot dipped galvanized and of configurations to match existing hardware. Bolts and nuts shall comply with ASTM A 307 and galvanized in compliance with ASTM A 153.
  - 2.4 Finish: All wood fence members shall be given a pressure preservative treatment in a closed retort. The treatment shall comply with Fed. Spec. TT-W-571. Wood cut or sawed after treatment shall have the cut surfaces well brush-coated with the preservative used in the treatment. Paint to match existing after treatment and installation.



3.0 EXECUTION:

- 3.1 Posts: Hold in line in a true vertical position by temporary bracing until backfilling is completed. Compact by hand tamping or other suitable methods to a density comparable to that of adjacent ground. Posts of fencing that are higher than four feet and exposed to strong winds and posts at all gates shall be of heavy construction and shall be embedded in concrete.
- 3.2 Rails: Install at the height and in the manner required to match existing fencing, and secure to post with fasteners similar to existing.
- 3.3 Pickets: Space, attach, and position to match existing pattern and attachment methods.
- 3.4 Accessories: Install to match existing conditions.

END OF SECTION 02713



## SECTION 02719

### MODULAR RETAINING WALL

- 1.0 DESCRIPTION: This specification covers the furnishing and installation of materials for concrete retaining wall units, and furnishing and installing accessories, all as indicated. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.02 REFERENCED DOCUMENTS: Industry Standards
- A. American Society for Testing and Material (ASTM)
    - C33 Specification for Concrete Aggregate
    - C55 Concrete Building Block
    - C90 Hollow Load-Bearing Concrete Masonry Units
    - C133 Standard Specification for Lightweight Aggregate
    - C140 Sampling and Testing Concrete Masonry Units
    - C145 Solid Load-Bearing Concrete Masonry Units
    - C150 Portland Cement
    - C426 Drying Shrinkage of Concrete Block
  - B. Geosynthetic Research Institute
    - GG1-87 Standard Test Method for Geogrid Rib Tensile Strength
    - GG2-87 Standard Test Method for Geogrid Junction Strength
    - GG3a-90 Standard Test Method for Tension Creep Testing of Geogrids
    - GG4a-90 Standard test Method for Determination of the Long Term Design Strength of Geogrids
    - GG5-91 Standard Practice for Evaluating Geogrid Pullout Behavior
  - C. National Concrete Masonry Association (NCMA) TEK 50A Specification for Segmental Retaining Wall Units.
- 1.03 DEFINITIONS
- Block Facing Units - Hollow concrete structural retaining wall units, plant cast from Portland cement, water, and mineral aggregates with or without the inclusion of other materials. The units are intended for use in the construction of mortarless, segmental retaining walls.



Geogrid - A geosynthetic formed by a regular network of integrally connected tensile elements with apertures of sufficient size to allow interlocking with surrounding soil, rock, or earth and function primarily as reinforcement.

Unit Fill - Compacted fill for the voids in the precast concrete wall units.

Wall Fill - Compacted soil which is within the geogrid reinforced soil mass.

Retained backfill - Any compacted soil which is behind the reinforced wall fill.

Foundation Soil - Compacted or in-situ soil beneath the entire wall.

#### 1.04 QUALITY CONTROL

- A. Test units for 28-day strength in accordance with ASTM C140. Average compressive strength shall be not less than 3000 psi.
- B. Test units for freeze/thaw protection in accordance with ASTM C90, and for water retention in accordance with ASTM C941.
- C. After unit samples have been accepted, erect and clean sample wall, of minimum of 15 square feet, of each type of retaining wall. Sample wall shall be representative of retaining wall exposed in finished areas. Each sample wall will be checked for shade range, texture, soundness of construction, surface cleanliness, and conformity with other requirements of this Section. Secure acceptance of each cleaned sample wall from the Contracting Officer before starting work. Protect wall from damage. Remove sample wall after retaining walls have been accepted.

#### 1.05 JOB CONDITIONS

- A. Protect surfaces of weather-exposed units at end of each day and at start of each shut-down period with nonstaining waterproof cover extending at least two feet down on all sides of structure.
- B. Protect surfaces and products adjacent to work that could possibly be damaged by water and cleaner.

#### 1.06 DELIVERY, STORAGE AND HANDLING

- A. Retaining Wall Facing Units:
  - 1. Contractor shall check the units and connection accessories upon delivery to ensure that proper materials have been received.
  - 2. Contractor shall prevent excessive mud, wet cement, epoxy, and like materials from coming in contact with and affixing to the units.
  - 3. Contractor shall protect the units from damage (i.e. cracks, chips, spalls). Damaged units shall be evaluated for usage in the wall according to ASTM: C-90-75 (1981 Rev.) and ASTM: C-145-75 (1981 Rev.)
- B. Geogrid
  - 1. Contractor shall check the geogrid upon delivery to ensure that the proper material has been received.
  - 2. Geogrids shall be stored above -20°F (-29°C).





## 02000 - Site Work

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3. Contractor shall prevent excessive mud, wet cement, epoxy, and like materials from coming in contact with and affixing to the geogrid material.
4. Rolled geogrid material may be laid flat or stood on end for storage.

### 2.0 PRODUCTS

2.01 CONCRETE RETAINING WALL UNITS: Modular unit face dimensions of eight inches thick by 18 inches long. Depth dimensions shall be no less than 20 inches. Dry unit weight of wall units shall be no less than 90 lbs. When tested in accordance with ASTM C426, average linear shrinkage of three specimens shall be less than 0.045 percent. Color of faces and texture exposed to view shall be determined by the Contracting Officer.

- A. Standard modular units: ASTM C90, lightweight, two-cell type. Aggregate: ASTM C331(C33).
- B. Solid mini or cap units: ASTM C145, lightweight type. Aggregate: ASTM C331(C33).

2.02 CONNECTING PINS: Poltruded polyester resin rods with fiberglass reinforcement; minimum flexural strength 100,000 psi.

2.03 GEOGRID: The geogrids shall be a regular grid structure of select high density polyethylene or polypropylene resin and meet or exceed the design pullout test values required to stabilize and retain the fill above retaining wall.

2.04 UNIT FILL: Gradation Size No. 67, or crushed stone drainage material acceptable to modular unit manufacturer.

2.05 BASE MATERIAL: Material shall consist of compacted sand, gravel, crushed rock or leveling concrete (non-reinforced) as shown on construction drawing. The compacted leveling pad shall be a minimum 6 inches thick.

2.06 BACKFILL, FOUNDATION BACKFILL AND WALL FILL: As specified in 02EA, EARTHWORK.

2.07 UNDERDRAIN: As specified in UNDERDRAIN SYSTEMS.

2.09 CLEANER: ProSoCo, Inc.'s Sure Klean, or accepted equivalent. Cleaner shall be capable of removing contaminants without damaging units.

### 3.0 EXECUTION

#### 3.01 EXAMINATION

- A. Examine excavated surfaces. on which units will be placed, for conditions adversely affecting work.
- B. Examine delivered units for damage and for foreign material.
- C. Examine delivered geogrid for damage and for foreign material. Any grid that has been received of which coating has been removed and exposed reinforcement to elements shall be rejected.

#### 3.02 PREPARATION

- A. Lay out retaining wall establishing accurate spacing of units.



- B. Cutting and fitting shall be done by skilled mechanics. Cut edges clean, true, and sharp. Dry-cut units, exposed-to-view, with masonry saw. Size of unexposed parts may be reduced with masonry hammer and chisel.

3.03 INSTALLATION

- A. 1. Place base material to a minimum of 6 inches of compacted thickness. Material shall be compacted so as to provide a level hard surface on which to place the first course of units. Compaction shall be to 95% of standard proctor for sand or gravel type materials. For crushed rock, material shall be densely compacted. Grade top of base to plus/minus 1/4 inch of indicated level.
2. Install underdrain UNDERDRAIN SYSTEMS.
- B. Install first course of units in full contact with base, with vertical joints butted and top dead level; align unit faces. Install connecting pins, if required, and fill voids; tamp void fill and sweep top of units clean.
- C. Lay successive units locking onto laid course at prescribed batter. Fill voids as work progresses.
- D. Place geogrid on compacted, level backfill at indicated elevations and orientation. Hook leading edge over connecting pins and pull taut; anchor before placing additional backfill. Tracked mechanical equipment is not permitted on geogrid. Compaction of fill within 3 feet of wall face shall be by hand operated equipment.
- E. Tolerances
1. Variation from designed incline lines and controlling surface of walls: within 2 inches in 20 vertical feet.
2. Variation from conspicuous vertical lines: within 1 inch of 20 vertical feet.
3. Variation from level and other conspicuous horizontal lines: within 1 inch in 20 horizontal feet, and within 2 inches in 40, and more, horizontal feet.
4. Variation of linear wall lines from established position in plan: within 1 inch in 20 feet, and within 2 inches in 40, and more, feet.

3.04 CLEANING: Clean installed work after completion of setting and backfill.

- A. Before cleaning, protect adjacent surfaces and plants sensitive to masonry cleaner.
- B. Wet wall and apply cleaner in accordance with cleaner manufacturer's printed instructions. Rinse units with clean water to remove masonry cleaner and sand. Installed work shall be clean and free from discoloration, stains, and smears.

END OF SECTION 02719



## SECTION 02721

### GUARD RAIL AND IMPACT ATTENUATORS

#### PART 1 - GENERAL

- 1.01 DESCRIPTION: This specification covers the furnishing and installation of materials for guard rail and impact attenuators. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
  - 2.0 PRODUCTS
    - 2.01 GUARD RAIL ELEMENTS AND FITTINGS: Steel; GDOT SSCRB, Section 859.01A.
    - 2.02 CABLE END ANCHOR ASSEMBLY: GDOT SSCRB, Section 859.02. Concrete deadman: Class 3000; Section 03KA, PORTLAND CEMENT CONCRETE.
    - 2.03 STEEL POSTS AND OFFSET BLOCKS: GDOT SSCRB, Section 859.03.
    - 2.04 WOOD POSTS AND OFFSET BLOCKS: GDOT SSCRB, Section 859.05.
    - 2.05 GALVANIZE REPAIR COMPOUND: GDOT SSCRB, Sections 870.01 and 870.06C.
    - 2.06 ATTENUATOR: stationary type conforming to GDOT SSCRB Section 650, Type B; 11 feet, nine inches long; three feet wide; and have three bays.
    - 2.07 CONCRETE PAD: Class 3000 concrete conforming to requirements of Section 03KA, PORTLAND CEMENT CONCRETE.
  - 3.0 EXECUTION
    - 3.01 INSTALLATION
      - A. Posts: GDOT SSCRB, Section 641.03A.
      - B. Rail: GDOT SSCRB, Section 641.03B.
      - C. Anchorage: GDOT SSCRB, Section 641.03D.
    - 3.02 REPAIRING DAMAGED GALVANIZED COATING: GDOT SSCRB, Section 645.
    - 3.03 ATTENUATOR: Install in accordance with GDOT SSCRB Section 650 and manufacturer's printed installation instructions.
    - 3.04 CONCRETE: Place in accordance with Section 03MA, CAST-IN-PLACE CONCRETE.
- END OF SECTION 02721



## SECTION 02730a

### PLAYING FIELDS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of playing fields. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
  - 2.1 Fills required to bring the subgrade of playing surfaces up to required elevation shall be placed in horizontal layers of not more than 8 inches in loose thickness. The top layer of all fills and excavated areas under the playing surfaces shall be compacted to 95 percent maximum density in accordance with ASTM D 698.
  - 2.2 Sand-Clay Playing Surfaces shall consist of a stone foundation course, a clay foundation course, a wearing course and, where equipped, a drainage filter course, constructed on the prepared subgrade.
    - 2.2.1 Stone Foundation Course: A layer at least 3 inches thick of 3/4- to 1-1/2 inch crushed stone shall be spread over the subgrade or over the drainage filter course constructed thereon and shall be given preliminary compaction by rolling, followed by a filler consisting of 1/4- to 1/2-inch crushed stone to fill voids in the underlying stone. The stone foundation course shall be compacted to a minimum of 95 percent maximum density in accordance with ASTM D 698.
    - 2.2.2 Clay Foundation Course: Selected inorganic fat clay (CH) shall be evenly spread on the stone foundation course to produce a compacted layer not less than 3 inches thick. The clay layer shall be compacted to a minimum of 90 percent of CE 55 maximum density in accordance with ASTM D 698.
    - 2.2.3 Wearing Course: The approved inorganic clay-silt mixture of approximately 50 percent each of clay and silt shall be screened through a 1/4-inch mesh screen. The wearing course shall be mixed in proportions of 1 part sand to 2 parts clay-silt by volume. The wearing course shall be compacted to at least 95 percent maximum density in accordance with ASTM D 698 and shall range from 1 to 1-1/2 inches in thickness.
    - 2.2.4 Drainage Filter Course: The drainage filter course shall consist of a well-graded aggregate course encased in a geotextile material and laid in such a manner to allow water to freely drain from the playing surfaces. The geotextile material shall be a woven or non-woven filter material with a minimum permeability of 0.02 cm/sec. The material shall be resistant to mildew, ratting, insects, rodents, and chemicals normally encountered in a subsurface drainage system.
  - 2.3 Bituminous Concrete Playing Surfaces shall consist of a base course, prime coat, bituminous leveling course, tack coat, surface course, color coating and, where required, a drainage filter course, all constructed on a prepared subgrade. The stabilized-aggregate base course shall be compacted at optimum moisture to at least 95 percent maximum density in accordance with ASTM D 698. Marshall



## 02000 - Site Work

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stability shall not be less than 500 pounds and the flow shall not be greater than 20/100 inch. The bituminous mixture shall be compacted until the voids in the total mix are reduced to less than 4.0 percent by volume.

2.3.1 Thickness of Courses: Base course shall be 4 inches thick after compaction. Leveling course shall be 1-1/2 inches thick after compaction unless directed otherwise. Surface course shall be 1 inch thick after Compaction.

2.3.2 Color Coating and Marking Paint: After curing of the bituminous surface course, the entire playing surface shall be covered with a color coat as required.

2.4 Portland Cement Concrete Playing Surfaces:

2.4.1 Aggregate: The nominal aggregate size shall be 1-1/2 inches to No. 4 sieve size and shall conform to ASTM C 33.

2.4.2 Portland Cement: The cement shall conform to ASTM C 150, Type IA or IIA; or ASTM C 595, Type IP-A.

2.4.3 Thickness: Horizontal Portland cement concrete playing surfaces shall consist of concrete slabs 4 inches thick.

2.5 Maintenance of Sand-Clay Surfaces: Prior to final acceptance, the Contractor shall make one application of 3/4 pound of calcium chloride per square yard to the sand-clay surface of the entire playing area.

2.6 Portable Outdoor Bleachers:

2.6.1 Bleachers shall be designed to support a uniformly distributed live load of 100 pounds per square foot of gross horizontal projection and a horizontal wind load of 30 lbs/sq ft of gross vertical projection. All seat and foot plank members shall be designed to support not less than 120 pounds per linear foot.

2.6.2 Wood Seating and Walk Boards shall be preservative-treated and painted.

2.7 Steel Basketball Poles: Minimum diameter 3-1/2 inches; galvanized pipe.

2.8 Running Track: Gravel and cinders over stone base; compaction to 95 percent of maximum density in accordance with ASTM D 698. One hundred percent by weight of the gravel and cinders shall pass the 3/4-inch screen, and 90 percent of the gravel and cinders shall be retained on the No. 4 screen.

3.0 EXECUTION: (Section not used).

END OF SECTION 02730a

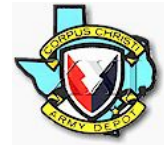


## SECTION 02730b

### COLORED ATHLETIC WEARING SURFACE

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of athletic wearing surface on asphaltic concrete base. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.1 Submit product data and manufacturer's application instruction.
- 2.0 PRODUCTS: Athletic wearing surface shall be the "Plexipave" system by California Products Corporation, 169 Waverly Street, Cambridge Ma. 02139 or equal.
- 2.1 Plexipave Court Patch Binder prepared as per manufacturers recommendations.
- 2.2 California Acrylic Resurfacer prepared as per manufacturers recommendations.
- 2.3 Fortified Plexipave Job Mix prepared as per manufacturers recommendations.
- 2.4 Plexipave Color Base as required by the Contracting Officer.
- 2.5 Plexichrome Color as required by the Contracting Officer.
- 3.0 EXECUTION:
- 3.1 Personnel used to install athletic wearing surface must have a minimum of three years experience and at least three jobs with similar square footage of placement.
- 3.2 When needed an asphaltic concrete base must be placed which will conform to manufactures planarity requirements.
- 3.3 Protect adjacent surfaces not to receive coating during application.
- 3.4 All finished surfaces must have a uniform appearance and be free of ridges and tool marks and shall not vary more than 1/8" in 10 feet measured in any direction.

END OF SECTION 02730b



## SECTION 02731

### RECREATIONAL FACILITIES

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of miscellaneous/recreational facilities. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.1 Shop Drawings and/or Catalogue Cuts shall be submitted for approval prior to any installation.
- 2.0 PRODUCTS :
- 2.1 Materials shall be resistant to corrosion and degradation by ultraviolet rays. Hardware and fittings shall be at least as corrosion-resistant as the materials fastened.
- 2.1.1 Steel Plates, Pipe, Tubing, Sheets, Wire Ropes, Chains, and Miscellaneous Shapes shall be stainless steel or galvanized steel, even if painted or coated with vinyl or other protective finish. All open pipe and tube ends shall have rain caps.
- 2.1.2 Wood shall be all-heart cedar, cypress, or redwood or shall be treated with a non-toxic preservative. Wood shall not be used where it will be in direct contact with the ground, unless approved by the Contracting Officer.
- 2.1.3 Fiberglass shall be smooth fiberglass-reinforced polyester with gelcoat coating and shall meet the following minimum physical properties: 22,000 psi flexural strength, 15,000 psi tensile strength, and 20,000 psi compressive strength.
- 2.1.4 Aluminum shall be anodized.
- 2.1.5 Foundations shall be 3,200 psi compressive strength concrete, enforced as required. Provide embedded anchorage items as required,
- 2.2 Playground Equipment, including see-saws, slides, swings, whirlers, and monkey bars, shall be prefabricated and designed to withstand the anticipated structural loads.
- 2.2.1 Exposed Surfaces shall be smooth (except where required to be nonslip) seamless, and nonsplintering.
- 2.2.2 Steps, Platforms, and Other Flat Surfaces Subject to Foot Traffic shall be non-slip, but not abrasive and shall be fanned to exclude or drain away water.
- 2.2.3 Fastening shall be flush, concealed, or otherwise formed or located to prevent injury to children playing on the equipment.
- 2.2.4 Slides shall have stainless steel sliding surfaces.
- 2.3 Bike Racks shall be mounted, and sections (if rack is sectional) shall be attached with tamper-proof fasteners.



## 02000 - Site Work

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- 2.4 Fiberglass Shelters shall be reinforced with steel, aluminum, or wood framework as required. Shelter roof shall be sloped to drain. Fiberglass edges shall be returned so that they are not exposed. Shelters shall be prefabricated and designed to withstand the anticipated live, dead, and wind loads.
- 3.0 EXECUTION: Recreational facilities shall be installed plumb, aligned, and securely anchored to the ground. Adjust equipment with moving parts until operation is smooth and easy.

END OF SECTION 02731





## SECTION 02800

### LANDSCAPING (general)

- 1.0 DESCRIPTION: All labor, materials, and equipment required by or inferred from drawings and specifications to complete work of this section.
- 1.01 QUALITY ASSURANCE
  - A. Plants shall equal or surpass quality as defined in the current issue of "American Standards for Nursery Stock" as published by the American Association of Nurserymen, Inc.
  - B. The selection of all materials and the execution of all operations required under the specifications and drawings shall be subject to the approval of the Contracting Officer. They shall have the right to reject any or all materials and any or all work which in their opinion, does not meet the requirements of the contract documents at any stage of the operations. All rejected materials shall be removed promptly from the site by the Contractor.
  - C. The Contractor is hereby made aware that the Corpus Christi Army Depot anticipates that the landscape installation of this facility shall be of the highest quality possible.
    - 1. All plant material shall be selected from the highest quality possible.
    - 2. All work to be performed, such as preparing planting pits, installing plant mix, planting procedures, staking, guying, and pruning shall be strictly managed and executed and performed by experienced personnel.
    - 3. A competent superintendent with on site decision making capacity will be present at all times.
- 1.03 GUARANTEE
  - A. The guarantee period for all trees, plants, shrubs or groundcover shall begin at the date of final acceptance by the Contracting Officer.
  - B. All plant materials shall be guaranteed by the Contractor for a period of one (1) year beginning at date of final acceptance of the work in total. This assumes that the Corpus Christi Army Depot has either contracted with the Contractor for such maintenance or that the Corpus Christi Army Depot has followed the prescribed maintenance procedures and that no such replacements are necessitated by neglect or abuse by the Corpus Christi Army Depot.
- 2.0 PRODUCTS
- 2.01 PLANTS
  - A. Specific requirements concerning the various species and the manner in which they are to be furnished are shown in the drawings and plant list.
    - 1. Quality: Plants shall be sound, healthy, and vigorous, well branched, and densely foliated when in leaf. They shall be free of disease, insect pests, eggs, or larvae, and shall have



healthy, well developed root systems. They shall be free from physical damage or adverse conditions that would prevent thriving growth. All plants shall be true to species and variety. Plants used where symmetry is required shall match as nearly as possible. No substituting will be permitted without written permission.

2. Stock furnished in a size range specified shall be interpreted to mean that not less than 50% shall be of the maximum size specified within each range.
3. Plants shall be measured when branches are in their normal position. Height and spread dimensions specified refer to main body of plant and not branch tip to tip. Caliper measurement shall be taken at a point on the trunk six inches (6") above natural ground line for trees up to four inches (4") in caliper and at a point twelve inches (12") above the natural ground line for trees over four inches (4") in caliper. If a range of size is given no plant shall be less than the minimum size acceptable and are the measurements after pruning, where pruning is required. Plants that meet the measurements specified, but do not possess a normal balance between height and spread may be rejected.
4. Plants shall conform to measurements specified except that plants larger than specified may be used if approved by the Contracting Officer or his designated agent. If the use of larger plants is approved, the ball of earth or spread of roots shall be increased proportionately.
5. Container grown plants in cans or wooden boxes of equal quality as balled and burlapped plants may be substituted in lieu thereof. Plants grown in container shall be delivered and remain in containers in a shady location until planted. Plants in container shall be watered prior to transportation and shall be kept moist until planted. The container must be removed prior to planting, care being exercised so as not to injure the plant.
6. Labels: At least one (1) tree and one (1) shrub of each variety shall be attached with a waterproof, durable label indicating correct plant name and size as indicated on plant schedule. Labels shall remain on plant material until the Contracting Officer request for their removal.

2.02 GRASS SEED

- A. Grass seed shall be approved by the Contracting Officer.

03 PINESTRAW MULCH

- A. Pinestraw mulch shall be clean, fresh and free of branches, cones, and foreign matter, noxious weed seeds, fire ants, Japanese Beetles and/or White Fringed Beetles.

2.04 COMMERCIAL FERTILIZER

- A. Commercial fertilizer shall be a complete fertilizer, 75% of the Nitrogen of which is derived from natural organic sources of urea form. The following Nitrogen-Phosphorus-Potash ratio types shall be applicable 12-8-8. It shall be delivered to the site in standard size unopened container, showing weight, analysis, and name of manufacturer. It shall be stored in a weatherproof storage place in such a manner that it will be kept dry. Fertilizer for trees, shrubs, and groundcover areas shall be a slow release type.

2.05 WATER



## 02000 - Site Work

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- A. Water will be available at the site and is furnished by the Corpus Christi Army Depot at no cost to the Contractor. Water transportation will be furnished by the Contractor.

### 2.06 CERTIFICATES OF INSPECTION

- A. Certificates of inspection shall accompany the invoice for each shipment of plants as may be required by law for transportation. File certificates with the the Contracting Officer prior to acceptance of the material. Inspection by Federal or State Governments at place of growth does not preclude rejection of plants at the site.

### 2.07 FIELD OBSERVATION OF PLANT MATERIALS PRIOR TO DIGGING

- A. The the Contracting Officer will inspect trees or plants from the bidders source for acceptability. In the event that the trees or plants are rejected, the Contractor shall pursue and examine other sources of plants until acceptable specimen are found. Such changes will not constitute an increase in cost to the Contracting Officer. Plants shall also be subject to inspection and approval by the the Contracting Officer for conformity to specification requirements. Such approval shall not impair the right of inspection and rerection during progress of the work. The Contractor shall inform the Contracting Officer in writing of the location of the plants he proposes to supply, at least 20 calendar days prior to proposed digging dates.
- B. Prepare plants for shipment in a manner that will prevent any damage to the branches, shape, or future development of the plant.
  - 1. The Contractor shall be solely responsible for the safe transportation of plants to the site and their condition upon arrival. Trees with abrasions of the bark, sunscalds, fresh cuts or breaks of limbs which have not completely callused will be rejected. Trees which have been damaged during transit shall be replaced with equal specimen trees by the Contractor at no additional cost.
  - 2. Protection against drying out: Handle plants so that roots, stems, and branches are adequately protected at all times from drying out. Plants that cannot be planted immediately upon delivery shall be kept in the shade, well protected with soil, wet moss or other acceptable material and shall be kept well watered. Plants shall not remain unplanted for longer than three days after delivery. All plants will be tarped at all times during transport.
  - 3. Digging: Retain as many fibrous roots as possible. Trees tagged prior to digging shall have the north side marked with a white or red spot. The painted spot shall not exceed 2" in diameter. All trees shall be planted with the painted mark orientated north unless the Contracting Officer advises otherwise.
  - 4. Balled Plants: Plants designed "B & B" shall be adequately balled with firm natural balls of soil in sizes as specified in American Standard for Nursery Stock. Balls shall be firmly wrapped in burlap and securely tied with heavy twine or rope. Plants with loose, broken or manufactured balls will be rejected. Balls shall be lifted from the bottom only, not by stems or trunks.
  - 5. Groundcover Beds shall be entirely cleaned of debris, roots, rocks, and vegetation: spread four inches (4") of topsoil or planting soil specified herein over the entire area to receive ground cover and incorporate to six inch (6") depth by tilling the entire bed with an



appropriate mechanical device. Plants shall be evenly spaced and set to finish grade requirements. Immediately, mulch with three inches (3") of clean mulch.

6. Seasonal Color Beds shall be prepared as follows: Spread a four inch (4") layer of "Mushroom Compost" or approved equal over the entire planting bed. Fill compost in thoroughly to a depth of an eight inch (8") minimum. Spread a one and a half inch (1 1/2") layer of "Mushroom Compost" or approved equal over the smoothed surface. Plant bedding plants into bed through the top layer. Mulch lightly with pine bark mini nuggets. Additional fertilization is not necessary at this time. Types of annuals to be installed shall be chosen at the time of installation based on the season. the Contracting Officer or his designated agent shall approve the selected material.

### 3.0 EXECUTION

#### 3.01 PLANTING

- A. All plants, deciduous and evergreens, shall be planted at such times of the year as the job may require, with the agreement of the Contractor to guarantee the material as herein specified. Actual planting shall be performed only during periods when weather conditions are suitable. Soil shall not be worked when it is too wet to be crumbled in the hand.

#### 3.02 LAYOUT OF MAJOR PLANTING

- A. Locations for plants and outlines of areas to be planted shall be approved by the Contracting Officer before excavation is begun. Review the applicable architectural and engineering utilities and have all utilities flagged in the filled before digging. The Contractor shall be fully responsible for all damage of utility lines.

#### 3.03 EXCAVATION OF PLANT TRENCHES AND PITS

- A. Dig pits as shown on planting details:
  1. If hardpan or other moisture barrier is encountered during excavation of any planting hole the Contractor shall fill the planting hole with water and observe for a period of not less than 12 hours. If at least 50% of the water has not percolated into the surrounding soil, the Contractor shall bore a twelve inch (12") wide hole to a depth of three feet (3') or more below the bottom of the planting hole and fill with gravel. If the planting hole still does not drain, Contractor shall notify the Contracting Officer in writing prior to installing any trees in the questionable area. Contractor will be responsible for the survival of all plant materials as specified in the warranty.

#### 3.04 SETTING PLANTS

- A. All plants shall be set so that when settled they will occur approximately one inch to three inches (1"-3") above the finished grade and also two inches to three inches (2"-3") above the grade that they bore to the natural grade before transplanting. Each plant shall be planted neatly in the center of the pit.
- B. All plants shall be installed as shown by planting details on drawings.
- C. All planting areas shall be treated with an appropriate pre-emergent herbicide to control weeds. Herbicides shall be applied as per manufacturer's instructions by qualified personnel.



## 02000 - Site Work

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### 3.05 SEEDING

- A. All areas designated "turf" shall be raked free of all rocks greater than 1/2" diameter. Roots, limbs and other foreign matter shall be removed prior to seeding.
- B. All areas to be seeded shall be disced and harrowed to a depth of six inches (6") prior to seeding. Areas with existing tree roots shall be disturbed to a lesser depth to protect roots as necessary. Surface shall be a smooth, consistent grade with 3% minimum slope away from building and/or directed to drainage swales or structures.
- C. Lime shall be applied at a rate of 100 lbs. per 1000 square feet. Add 5-10-15 fertilizer at manufacturer's suggested rate.
- D. Hydroseed all areas designated "turf" with "Rebel II" Fescue seed at rate recommended by the manufacturer. Hydroseed mixture shall include hydromulch.

#### E. RESEEDING

Areas within turf which do not develop a dense, consistent growth of grass shall be reseeded during the fall season following the initial seeding. Such areas requiring additional seeding shall be determined by the Contracting Officer. It shall be the responsibility of the Contractor to repair any erosional damage to the turf areas.

### 3.06 MULCHING

- A. All plantings shall be mulched with a four inch (4") layer of pinestraw immediately after planting has been completed. Pinestraw shall be thoroughly loosened and spread evenly over entire planting bed.
- B. All proposed trees planted in grass areas and all existing trees located in grass areas shall be mulched at the base with a five feet (5') diameter circle of pinestraw four inches (4") thick. Proposed evergreen trees with specified spreads greater than five feet (5') shall receive pinestraw in a diameter equal to its spread. Areas beneath the drip line shall be mulched with pinestraw four inches (4") thick. These areas are indicated as additional mulch.

### 3.07 WATER

- A. Water (soak) all plants immediately after planting, and continue thereafter as necessary until acceptance of the work in total.

### 3.08 STAKING, GUYING AND PRUNING

- A. Staking shall be completed immediately after planting. Plants shall stand plumb after staking in accordance with the details on the drawings. Trees three inches (3") or more in caliper shall be staked as shown by tree staking plan detail on drawings. Staking shall be completed immediately after planting.
- B. Pruning of deciduous material shall be limited to the removal of injured twigs and branches. Leave intact the normal shape of the plant unless otherwise directed by the Contracting Officer. Additional pruning may be required on trees of special type of character.



3.09 MAINTENANCE OF TREES AND SHRUBS

- A. Maintenance shall begin immediately after each plant is planted and shall continue until final acceptance of the work in total by the Contracting Officer with the following requirements:
1. Maintenance of new planting shall consist of pruning, watering, cultivating, weeding, mulching, tightening, and repairing of guys, resetting plants to proper grades or upright position, restoration of planting saucer, and furnishing, supplying, and applying, such sprays as are necessary to keep the planting free of insects and diseases. If planting is performed after grass area preparation, proper protection to grass areas shall be provided, and any damage resulting from planting operations repaired promptly. Maintenance shall be provided by the Contractor until the time of final acceptance of the work in total by the Contracting Officer.
  2. Planting areas and plants shall be protected at all times against trespassing and damages of any kind for the duration of the maintenance period. If any plants become damaged or injured, they shall be treated or replaced as directed by the Contracting Officer at no additional cost to the Corpus Christi Army Depot. Work shall be done within, adjacent to, or over any plant or planting area without proper safeguards and protection to the plant material.
  3. The Contractor shall be responsible for keeping all planting and work incidental thereto in good condition by replanting, replacing, watering, weeding, cultivating, pruning, spraying, reguying, and by performing all other necessary operations to care for promotion of root growth and plant life so that work is in satisfactory condition at acceptance.
  4. The root system of all plants shall be watered at such intervals as will keep the surrounding soil in the best condition for promotion of root growth and plant life.
  5. All planting and plant materials required by this contract shall be in a satisfactory and acceptable condition when the Contractor applies for payment.
  6. Sidewalks, street and other paved areas shall be continuously kept clean when planting and maintenance operations are in progress, and the entire work areas shall be cleaned at the end of each days work.

3.10 FIELD INSPECTION

- A. The Contracting Officer shall observe the total work for final acceptance upon written request at least ten (10) days before the anticipated date of the observation.

3.11 TERMINATION MAINTENANCE

- A. The Contractor's responsibility for complete maintenance (exclusive of replacement) shall terminate on the date of final acceptance which shall allow the maintenance program to continue. In the event that this program of maintenance by the Contractor is not continued, periodic visits to the site and inform the Contracting Officer of any discrepancies in the maintenance program.

3.12 PERIODIC INSPECTION

- A. The Contractor shall make periodic inspections, at no extra cost to the Corpus Christi Army Depot, during the guarantee period to determine what changes, if any, should be made in the



## 02000 - Site Work

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Corpus Christi Army Depot's maintenance program. All such recommended changes shall be submitted in writing to the Contracting Officer.

### 3.13 PLANT THEFT OR DAMAGE

- A. Contractor will be responsible for all plant materials on site until time of final acceptance.
- B. If the Contractor deems that theft of plant materials is or may be a problem he may take precautions to prevent it. Such precautions may consist of placing two sections of #3 rebar at angles through the rootball of plant materials. Rebar shall extend a minimum of 12" beyond rootball into ground and will not protrude above the surface of the rootball. Rebar must cross within the rootball mass. Other precautions may be taken with the approval of the Contracting Officer. Contractor shall not be responsible for plant theft if approved precautions are taken.

### 3.14 PLANT REPLACEMENT

- A. The Contractor shall replace without cost to the Owner, and as soon as weather conditions permit, all dead plants and all plants not in a vigorous thriving condition, as determined by the Contracting Officer during and at the end to the one (1) year guarantee period. Replacements shall closely match adjacent specimens of the Contracting Officer, prior to digging. Replacements shall be subject to requirements stated in this specification.

### 3.15 CONTRACTOR LIABILITY

- A. The Contractor shall make all necessary repairs to grades, lawn areas, and paving required because of the plant replacements. Such repairs shall be done at no extra cost to the Corpus Christi Army Depot.

### 3.16 REPLACEMENT PLANT ACCEPTANCE

- A. The acceptance of all replacement plants by the Contracting Officer shall terminate the Contractor's responsibility for such. In the event that a replacement plant dies, the Corpus Christi Army Depot may elect a subsequent substitution.

### 3.17 CLEARING OF GROUND

- A. Upon completion of the work, the grounds shall be cleared of all debris, of all superfluous materials and all equipment which shall be entirely removed from the premises to the satisfaction of the Contracting Officer.

END OF SECTION 02800



## SECTION 02810a

### SEEDING

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of seed. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
  - 2.1 Seed shall be the latest season's crop and shall be delivered in original sealed packages bearing the producer's guaranteed analysis for percentages of mixtures and pure live seed. Seed shall be labeled in conformance with U.S. Department of Agriculture rules and regulations under the Federal Seed Act and applicable State seed laws. Weed seed shall not exceed 1 percent by weight of the total mixture.
  - 2.2 Water shall not contain elements toxic to plant life.
- 3.0 EXECUTION:
  - 3.1 Preparation: Except on slopes steeper than 2 horizontal to 1 vertical, the soil shall be tilled to a depth of at least 4 inches. On slopes between 2 horizontal to 1 vertical and 1 horizontal to 1 vertical tillage, depths shall be 2 inches. On slopes steeper than 1 horizontal to 1 vertical, no tillage will be permitted.
  - 3.2 Application:
    - 3.2.1 Planting Seasons and Conditions: Planting shall not be done when the ground is frozen, snow covered, or in an unsatisfactory condition for planting.
    - 3.2.2 Seed shall be broadcast uniformly. The seed shall be covered to an average depth of 1/4 inch.
    - 3.2.3 Immediately after seeding, the entire area shall be firmed with a roller and the soil moistened to a depth of 6 to 8 inches.
    - 3.2.4 Protection of Turfed Areas: Immediately after seeding the area shall be protected against traffic or other use by erecting barricades, as required, and approved signs shall be placed at appropriate intervals until final acceptance.

END OF SECTION 02810a





## 02000 - Site Work

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### SECTION 02810b

#### SODDING

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of sod. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.02 DELIVERY, STORAGE, AND HANDLING
- A. Digging
- 1 Do not dig sod at the nursery or other approved source until ready to transport sod to the Project site or approved storage location.
  - 2 Before stripping, sod shall be mowed at a uniform height as indicated in paragraph 2.01 C3.
  - 3 Cut sod to specified thickness and to standard width and length desired.
- B. Transporting
- 1 Deliver sod on pallets. Protect sod against dehydration, contamination and heating during transport and delivery. Sod transported to the project in open vehicles shall be covered with tarpaulins or other suitable covers securely fastened to the body of the vehicle to prevent injury to the sod material and protect root system from exposure to wind or sun. Closed vehicles shall be adequately ventilated to prevent overheating of the sod. Evidence of inadequate protection against drying out in transit shall be cause for rejection.
  - 2 Sod shall be kept moist, fresh, and protected at all times, under shade or covered with moistened burlap, such protection shall encompass the entire period during which the sod is in transit, being handled, or in temporary storage.
  - 3 Upon arrival at the temporary storage location or the site of the work, sod shall be inspected for proper shipping procedures. Should the roots be dried out, the Corpus Christi Army Depot will reject the sod. When sod has been rejected, the contractor shall remove it at once from the area of the work and replace it.
- C. Storage of Sod
- 1 Do not deliver more sod than can be installed within 24 hours.
- D. Handling of Sod
- 1 Contractor shall take extreme care in the handling of sod material to avoid breaking, stretching, tearing or dropping strips. Sod that has been damaged by poor handling may be rejected by the Corpus Christi Army Depot.
- 1.03 QUALITY GUARANTEE



- A. Sod shall be uniform in color, leaf texture, leaf and root density, and free from weeds, diseases, insects and other visible imperfections at acceptance.

2.0 PRODUCTS

2.01 SOD

- A. Sod shall be nursery grown on cultivated mineral agricultural soils. Sod shall have been mowed regularly and carefully and otherwise maintained from planting to harvest.
- B. Grass Species:
  - 1. Stenotaphrum secundatum 'Floritam', St. Augustine, 'Floritam' Grass.
  - 2. Papalum notatum 'Argentine; Bahia Argentine Grass
  - 3. Cynodon Spp. 'Tifway 419', Bermuda Tifway 419 grass.
- C. All sod shall conform to the following requirements:
  - 1. Furnish in pads that are not stretched, broken or torn.
  - 2. Sizes
    - St. Augustine, Bermuda, and Bahia Sod pads shall be 18X24 inches in side (plus or minus 5%) with a 1-1/2 inch thickness (excluding top growth and thatch).
  - 3. Uniformly mowed height when harvested:
    - a. St. Augustine Sod - 2 inches in height.
    - b. Bahaia Sod - 2-3 inches if Argentine Bahia; 34 inches.
    - c. Bermuda - 3/4" to 1"
  - 4. Thatch: Maximum 1/2 inch uncompressed.
  - 5. Inspected and found free of disease, nematodes, pests, and pest larvae, by entomologist of State Department of Agriculture.
  - 6. Weeds
    - a. Sod shall be reasonably free of all objectionable weeds or weed seeds.
  - 7. Uniform in color, leaf texture, and density.
  - 8. Strength of Sod Strips: Sod strips shall be strong enough to support their own weight and retain their size and shape if suspended vertically when grasped in the upper 10% of the section.
  - 9. Moisture Content: Sod shall not be harvested or transplanted when moisture content (excessively dry or wet) may adversely affect its survival.
  - 10. Time Limitations: Sod shall be harvested, delivered, and transplanted within a 48 hour period.

2.02 WATER

- A. Free of substances harmful to plant growth, objectionable odor or staining agents.



## 02000 - Site Work

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### 2.03 TOP DRESSING FOR SOD

- A. A medium grain, clean, sharpe sand, free of silt, slug and any deleterious material. The sand shall be mined from a fresh water source.

### 2.04 TURF ROLLER

- A. Self propelled; with a maximum weight of 150 lbs per foot of roller width.

## 3.0 EXECUTION

### 3.01 INSPECTION

- A. Contractor will verify that the Board areas to be sodded are suitably prepared prior to the commencement of any work. If the areas are not suitably prepared the contractor shall notify the Contracting Officer immediately. Initiation of work by the contractor on any given site will constitute acceptance of the site as being properly prepared and ready for sodding.
- B. At the direction of the Contracting Officer, the vendor shall provide the necessary labor man power with the appropriate hand tools to fine grade the areas to be sodded. The grading shall round out all breaks in grade, smooth down all lumps and ridges, and fill all holes, voids and depressions. This service shall constitute a separate pay item as established on the bid proposal.

### 3.02 SODDING

- A. Weather Conditions
  - 1. Schedule work for periods of favorable weather.
  - 2. Sod placement on days which, in the judgment of the Contracting Officer are too hot, sunny, dry, or windy for optimal installation may be prohibited at the discretion of the Contracting Officer and at no additional cost to the Corpus Christi Army Depot.
- B. Begin sodding at bottom of slopes
- C. Lay first row of sod in straight line with long dimension of pads parallel to slope contours.
- D. Butt side and end joints. Ensure that joints are tight, thereby eliminating the need to patch and/or top dress to eliminate gaps.
- E. Lateral joints shall be staggered.
- F. Do not stretch or overlap rows.
- G. Peg sod on slope ratio or 1 in 3 or greater with minimum of two stakes per square yard.
- H. At the direction of the Contracting Officer, roll the sod with a turf roller to eliminate air pockets.
- I. At the direction of the Contracting Officer, top dress with sand as required to eliminate minor holes, voids, cracks, and depressions. Sod shall not be smothered with excess top dressing material.
- J. At the direction of the Contracting Officer, the vender will provide the necessary labor, equipment and materials to water the new sodding. The quantity of water and the frequency of application will be determined by the Contracting Officer.



## 02000 - Site Work

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- K. While the work is in progress the contractor will be responsible to protect the work area from vehicular or pedestrian traffic.
- L. The contractor shall provide and maintain all required safety devices and/or barriers necessary to maintain a safe work area.
- M. Upon completion of the work the vendor will remove all excess material, clean up the work area and repair any collateral damage to the grounds or the facilities.

END OF SECTION 02810b



## SECTION 02820

### TOPSOIL

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of topsoil. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Topsoil shall be free of rocks limbs and roots. It shall be thoroughly blended and consist of one of one of the following as directed by the Contracting Officer:
- A. 50% Organic "muck" / 50% sand
  - B. 20% Organic "muck" / 80% sand
- 2.2 pH Adjusters:
- 2.2.1 Agricultural Limestone shall have a minimum calcium carbonate equivalent of 90 percent.
  - 2.2.2 Other Liming Materials shall have a minimum calcium carbonate equivalent of 80 percent.
  - 2.2.3 Aluminum Sulfate shall be commercial grade.
- 2.3 Soil Conditioners and Amendments:
- 2.3.1 Peat shall be a natural, product conforming to ASIM D 2607.
  - 2.3.2 Sand shall be clean and free of toxic materials.
  - 2.3.3 Vermiculite shall be horticultural grade and free of any toxic materials.
  - 2.3.4 Rotted Manure shall be unleached stable or cattle manure containing no chemicals or ingredients harmful to plants.
  - 2.3.5 Rotted Sawdust shall be free of chips, stones, sticks, soil, and toxic substances.
  - 2.3.6 Gypsum shall be 90 percent pure and free of any toxic materials.
- 2.4 Fertilizer shall be commercial grade, free flowing, uniform in composition and shall conform to applicable State and Federal regulations. Granular fertilizer shall conform to Fed. Spec. 0-F-241, Type I, Level B.
- 2.5 Soil Fumigant shall be 97 percent methyl bromide and 3 percent chloropicrin.
- 2.6 Mulch shall be straw, hay, or fiber mulch applied simultaneously with grass seed and fertilizer.
- 2.6.1 Straw shall be stalks from oats, wheat, rye, barley, or rice that are free from noxious weeds, mold, or other objectionable material.



- 2.6.2 Hay shall be native hay, sudan-grass hay, broomsedge hay, or other herbaceous mowings, free from noxious weeds, mold, or other objectionable material.
- 2.6.3 Wood Cellulose Fiber for use with hydraulic application of grass seed and fertilizer shall consist of specially prepared wood cellulose fiber or a combination of wood cellulose and recycled news-print fibers.
- 2.7 Asphalt Adhesive for application with straw or hay mulch shall be cutback asphalt conforming to ASTM D 2038, or emulsified asphalt conforming to ASTM D 977.
- 2.8 Herbicide and Pesticide use must comply with all Controlling Agencies.
- 3.0 EXECUTION:
- 3.1 Placing Topsoil: Topsoil shall be distributed uniformly and spread evenly to an average thickness of 3 inches, with a minimum thickness of 2 inches. Soil compacted by construction equipment or soil on compacted cut slopes of grades shall be pulverized to a minimum depth of 2 inches by disking or plowing before applying topsoil.
- 3.2 Application of Soil Conditioners: All fertilizers, pH adjusters, and soil conditioners shall be incorporated into the soil to a depth of at least 4 inches.
- 3.3 Application of Soil Amendments: Soil amendments shall be spread uniformly over the soil and thoroughly incorporated into the existing soil to a depth of 8 inches.
- 3.4 Mulch shall be spread uniformly in a continuous blanket, using 1-1/2 tons per acre.

END OF SECTION 02820



## SECTION 02830

### TREE RELOCATION

- 1.0 DESCRIPTION OF WORK: This specification covers Labor, materials, necessary equipment and services to complete the tree relocation work. Before tree excavation, pruning, removal, or relocation of existing trees, contractor shall notify:
- A. Contracting Officer of schedule of operation.
  - B. Appropriate utility companies and the Contracting Officer for flagging and coordination of service disconnection as necessary to complete work.
  - C. Coordinate work with other trades.

1.1 DEFINITIONS

- A. Toxic Substances: Do not deliver any toxic substance or item as defined by the state, to the site without furnishing to the Contracting Officer a Material Safety Data Sheet (MSDS). Provide current MSDS information with each initial shipment.

The MSDS shall contain the following information:

- 1. The chemical name and the common name of the toxic substance.
- 2. The hazards or other risks in the use of the toxic substance, including:
  - a. The potential for fire, explosion, corrosivity and reactivity.
  - b. The known acute and chronic health effects of risks from exposure, including the medical conditions which are generally recognized as being aggravated by exposure to the toxic substance.
  - c. The primary routes of entry and symptoms of overexposure.
- 3. The proper precautions, handling practices, necessary personal protective equipment, any other safety precautions in the use of or exposure to the toxic substance including appropriate emergency treatment in case of overexposure.
- 4. The emergency procedure for spills, fire disposal, and first aid.
- 5. A description in lay terms of the known specific potential health risks posed by the toxic substance intended to alert any person reading this information.
- 6. The year and month, if available, that the information was compiled and the name, address, and emergency telephone number of the manufacturer responsible for preparing the information.

1.2 DESCRIPTION

- A. Protect existing trees to remain during construction phases. Provide tree protection barriers for those existing trees adjacent to tree transplantation operations. Any trees scarred or destroyed,



designated to remain, will be replaced at the Contractor's expense, with similar species, size, and quality.

- B. Remove other vegetation as necessary and as directed by the Corpus Christi Army Depot to accommodate new plantings. Prepare areas to be planted according to Section 02900.
- C. Resulting tree pits of relocated material shall be backfilled with clean fill and brought back flush with surrounding grade, unless the pits are to be immediately replanted. Stabilize grade if required. Correct problems caused by erosion, wind, etc., in the reclaimed area. Pits to be quickly replanted shall be surrounded by safety barricades to prevent accidental falls into pits.
  - 1. In areas where new plant material will replace relocated plant material, appropriate planting soil mix shall be used as backfill.

### 1.3 SUBMITTALS

- A. Submit a list of equipment, procedure, and labor force anticipated for use for tree relocation for approval by the Contracting Officer.
- B. Submit a schedule by day indicating units to be dug and relocated. Note materials requiring root pruning, and that the relocation schedule is to begin at the end of the specified root pruning period.
- C. Obtain permits required by authority having jurisdiction.
- D. Submit written certification that trees indicated to remain have been protected during the course of construction according to recognized standards of the industry. Certify that where damage did occur:
  - 1. Trees were promptly and properly treated.
  - 2. Indicate which damaged trees (if any) are incapable of retaining full growth potential and are recommended to be replaced.
- E. Submit for approval, proposed methods, and schedule for effecting tree and plant protection.

### 1.4 QUALITY ASSURANCE

- A. The Contractor's crew used for the relocation of existing trees shall have minimum 10 years experience in relocation of existing plant materials and be recognized by the American Association of Nurserymen.
- B. Unless otherwise specified, tree transplanting shall comply with NAA Ref.1.
- C. Comply with NAA standards for pruning and remove branches from trees to remain to clear new construction.
- D. Recommend procedures to compensate for loss of roots (if any) and perform initial pruning of branches and stimulation of root growth where removed to accommodate new construction.
- E. Perform tree repair work for damage incurred by new construction.
- F. Provide routine progress evaluation reports on relocated trees until the end of the maintenance period.





## 02000 - Site Work

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- G. Evaluate existing trees and verify trees are free of disease and ready to survive relocation from the site to their new location on-site or off-site.

### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Properly handle trees and palms during moving so trunks will not be scarred or damaged and to avoid broken limbs. Broken limbs not causing the tree to be rejected shall be repaired as follows:
  - 1. Properly prune dead, dying, or damaged branches with clean, sharp equipment.
  - 2. Remove injured bark and wood of a tree would with a clean, sharp knife to a point where healthy bark and wood make contact at their margins.
  - 3. Inspect and treat wound for insect and disease.
  - 4. Seal wounds with bituminous base wound paint for all oak limbs greater than 3 inch diameter.
- B. Transport trees on vehicles of adequate size to prevent overcrowding, broken limbs, foliage damage, or root ball damage.
- C. Keep root balls moist during relocation.
- D. Protect tree crowns with shade cloth to prevent desiccation and wind burn. Crowns shall be periodically sprayed with water to help ensure against desiccation.
- E. Handle plant material only in ways and means accepted by the landscaping industry and accepted by the Contracting Officer.
- F. Plant material shall be planted the same day it is dug. Coordinate preparation of planting pits or beds to ensure this schedule.

### 1.6 WARRANTY

- A. Relocated plant material does not fall under the standard 12 month guarantee.
- B. For relocated trees or palms that die, replace their canopy area with new trees as specified.
  - 1. Canopy spread for all palms and trees shall be listed on proposal when submitted for relocation work.
  - 2. Replacements (mitigation plantings) shall be provided at no additional cost to the Contracting Officer.
  - 3. Submit the attached form to the Contracting Officer for review and approval.
  - 4. Proposed replacement canopy tree species shall be the Contracting Officer accepted trees and palms.
- C. Repair damage to other plants and lawn or construction work within the relocation area during tree transplantation at no cost to the Contracting Officer. This includes, but is not limited to, damage to curbs, walks, roads, fences, site furnishings, etc. Replacing and replanting of damaged trees, shrubs or turf shall be according to Section 02800.

### 1.7 MAINTENANCE



- A. Maintain relocated plant materials immediately after each item is planted and continued until the 90 day watering period is completed, upon which time the Contracting Officer will take over maintenance of materials following procedures and recommendations of contractor and specifications.
- B. During the maintenance period, maintain relocated plant materials.

2.0 PRODUCTS:

2.1 MATERIALS

- A. Bone meal shall be readily available steamed bone meal, useable as a natural organic nitrogen fertilizer.
- B. Peat moss, topsoil, planting soil, mulch, staking, and guying, shall be as specified in section 02820.

3.0 EXECUTION:

3.1 TRANSPLANTATION

- A. Transplanting shall consist of on-site or off-site transplanting of existing trees or palms from proposed school construction areas to permanent positions as noted on the drawings.
- B. Digging, Wrapping, and Handling: Plants shall be dug and prepared for moving in a manner that will not cause damage to branches, shape, root system, and development.
- C. Balled and Burlapped Plants:
  - 1. Balls shall be firmly wrapped with burlap or accepted cloth substitute.
  - 2. No balled plant will be acceptable if the ball is cracked and broken or if the stem or trunk is loose in the ball, either before or during transplanting.
  - 3. Balled plants shall be lifted and handled from the bottom of the ball.
  - 4. Protect ball and deliver to the site, plant immediately, and water thoroughly.
  - 5. Ball sizes shall be as recommended in ANSI Z60.1

3.2 PLANTING

- A. Relocated Material:
  - 1. Relocated trees/palms shall be planted according to procedures described for new material, Section 02900. Verify final grades have been established before planting operations. Ensure proposed planting pits drain by test-filling with water before transplantation.
  - 2. Continue watering and caring for relocated material as specified.
  - 3. Mulch tree pit areas to reduce weeds, discourage foot traffic, conserve moisture, and minimize temperature fluctuations.
  - 4. Brace trunk and leave in place for approximately one year until trees are wind firm.



## 02000 - Site Work

5. Wrap trunks and structural branches of thin-barked trees to protect against sun scald and dehydration. Retain through at least one growing season, and through cold season.
6. Feed with a diluted solution of N-P-K in solution form with a soil needle, providing water, air, and nutrients.
7. Where foliage is retarded, spray with one of the soluble types of foliage feeders.
8. At time of planting, fill air pockets and keep roots, especially feeder roots, moist, live, and healthy. Use soil needles for watering new transplants. Direct fine spray at foliage to help harden-off new leaves.

### 3.3 STAKING AND GUYING

- A. Stake and guy designated material according to procedures described for new plant materials, Section 02900.

### 3.4 WATERING

- A. Following transplantation, water trees daily for the first two weeks, every other day for the next three weeks, and every third day for the balance of the three month watering/maintenance period. Such watering shall thoroughly saturate the root ball to its full depth.
- B. Following relocation, trees designated for transplanting shall be watered as specified in this section. Such watering shall thoroughly saturate the root ball to its full depth.
- C. Provide manual watering of relocated plant materials for 90 days. If used, after watering period, Contractor shall be responsible for the complete removal of all temporary watering systems.

### 3.5 TAGGING

- A. Trees within the designated areas for relocation shall be clearly marked by means of yellow plastic surveyor's ribbons and coordinated with, inspected, and accepted by the Contracting Officer before root pruning and digging.

### 3.6 ROOT PREPARATION

- A. Trees to be relocated shall be root pruned at least 45 days before digging with clean, sharp equipment.
  1. Maintain root pruned materials by watering, weeding, mowing, spraying, fertilizing, and other horticulture practices.
  2. After root pruning, backfill with good rooting medium, fertilize with organic fertilizer to promote root growth.
  3. Mulch to reduce weeds, discourage foot traffic, conserve moisture, and minimize temperature fluctuation.
- B. Root Ball Size Chart: Root ball sizes shall be according to minimum standards set forth in Grades and Standards for Nursery Plants Part II, Palms and Trees, Florida Department of Agriculture.
  1. Trees-Minimum Ball Sizes:

Caliper	Minimum Ball Diameter
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3-1/2" to 4"	28"
4" to 4-1/2"	30"
4-1/2" to 5"	32"
5" to 5-1/2"	34"

Larger sizes increase proportionally.

2. Minimum Ball Depth:

Ball Diameter	Depth
Less than 20"	Not less than 75 percent of diameter.
20" to 30"	Not less than 65 percent of diameter.
30" to 48"	Not less than 60 percent of diameter.

3.7 CROWN PREPARATION

A. Shade and Flowering Trees:

1. Shade Trees: Selectively prune and thin crown to remove approximately one third of the branches. Preserve the basic shape and form of the tree, eliminate cross-branching and dead or diseased branches.
2. Hand strip selected species of all leaves following pruning and before moving.

B. Palms: Follow standard procedure for transplantation of palms.

3.8 HAND DIGGING

- A. Burlapping is required. Trees that are burlapped for relocation shall comply and be handled in same manner as new plant material specified in Section 02800.

3.9 SPECIAL CONDITIONS

- A. Multi-Trunk Trees: Relocate multi-trunk tree as one unit. Measure unit by taking the aggregate total of all DBH measurements.
- B. Multi-Trunk Palms: Relocate multi-trunk palms as one unit. Unit shall be measured as follows:
1. 50 percent of the value in dollars of the largest trunk in the grouping times the number of trunks in the clump.
- C. On-site relocation:
1. On-site relocation shall include root pruning, canopy pruning, on-site transportation, hauling and dumping of debris, and 90-day maintenance.
  2. If the tree or palm should die within the 90 day maintenance period, remove the tree, replace the material, and restore the site at no additional cost to the Contracting Officer.

3.10 CLEANING

A. Cleaning up the Site:

1. Upon completion of the work, thoroughly clean up the project site.



## 02000 - Site Work

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2. In addition to removing equipment, unused materials, deleterious material, and surplus excavated material, the Contractor shall fine grade all disturbed areas and the areas adjacent to the transplanted material to provide a neat and uniform site.
3. All damaged or altered existing structures, as a result of the landscape work, shall be corrected.

END OF SECTION 02830





## SECTION 02831

### TREE AND PLANT PROTECTION

#### 1.0 SUMMARY

- A. Section Includes: Protection of existing trees and plants from damage because of Contractor's operations including, but not limited to:
  - 1. Protection of existing natural woodlands.
  - 2. Marking of clearing limits.
  - 3. Vegetation protective signage.
  - 4. Tree protection fencing.
  - 5. Boxing of tree trunks.
  - 6. Root pruning, construction pruning, and root protection.

#### 1.1 SUBMITTALS

- A. Proposed methods and schedule for tree and plant protection.
- B. Proposed methods, materials, and schedule for root pruning, construction pruning, and tree fertilization.

#### 1.2 QUALITY ASSURANCE

- A. Comply with the most stringent applicable requirements of the following standards.
  - 1. American National Standards Institute (ANSI) Z133.1 - Safety Requirements for Pruning, Trimming, Repairing, Maintaining and Removing Trees, and for Cutting Brush.
  - 2. International Society of Arboriculture (ISA) - Guide for Establishing Values of Trees and Other Plants.
  - 3. National Arborist Association (NAA) - Ref.1, Pruning Standards for Shade Trees.
  - 4. International Society of Arboriculture (ISA) - Construction Management Guidelines.
- B. Damaged Trees/palms:
  - 1. Trees scheduled to remain and are damaged during construction shall be replaced per canopy equivalency at no expense to the Contracting Officer.
- C. If any shrubs designated to be saved are damaged and replacement is required, a number and diameter of shrubs of the same species and variety, as determined by the Corpus Christi Army Depot shall be furnished and planted by the Contractor. The total inch diameter of the replacement shrubs shall equal the diameter of the shrub to be replaced.

#### 2.0 PRODUCTS



## 2.1 COMPONENTS

### A. Tree Protection Fencing:

1. Tree protection fencing shall be 4 feet high galvanized chain link fencing.
2. Stakes for fencing shall be 8 feet galvanized steel posts, driven a minimum of 3 feet into the ground. Posts shall be spaced 10 feet o.c. maximum.

### B. Boxing (Fencing):

1. Boxing shall be 4 inch x 4 inch posts spaced 8 feet o.c., with 2 inch x 4 inch rails between bays approximately 24 feet x 24 feet centered on the tree trunk, to a height of approximately 5 feet.

### C. Root Pruning:

1. Peat moss and mulch materials shall be as specified under Section 02810.
2. Liquid fertilizer applied to root pruned and construction pruned trees shall be Sequestered-Cleated Soluble Fertilizer.
3. Dormant oil spray shall be a dormant miscible spray.

## 3.0 EXECUTION

### 3.1 INSTALLATION

#### A. Fencing:

1. Before start of demolition work and clearing and grubbing operations, tree protection fencing shall be installed at all trees designated to be protected. Fencing shall be installed a minimum of 15 feet beyond the drip line of trees to be protected, unless otherwise accepted the Corpus Christi Army Depot.

#### B. Boxing:

1. Box trees to remain and not within designated tree protection areas.

#### C. Root Pruning:

1. Where construction will occur close to existing trees designated to remain, roots shall be pruned. Proximity shall be as determined in the field the Corpus Christi Army Depot.
2. Root pruning is the physical cutting of tree roots to minimize root damage and promote healing. Suitable means for root pruning include trenching, vibrating plow, or stump grinder. Any method capable of tearing roots or disturbing the soil beyond the grading limit is not allowed.
3. Root prune trees as noted to a depth of 24 inches by trencher, backhoe, or other approved means.
4. Backfill root pruning trench with existing soil mixed with peat moss or well-rotted sawdust to a mixture of approximately 75 percent soil and 25 percent humus. Tamp lightly to set soil.





## 02000 - Site Work

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5. Apply mulch to a depth of 4 to 6 inches at minimum dripline radius around tree to reduce compaction and increase moisture retention. Mulch depth shall be feathered to grade at base of trunk.
- D. Construction Pruning and Root Protection:
1. To compensate for root zone damage by cut or fill work, prune top of tree to approximate percent of damaged root zone area.
  2. Construction pruning shall consist of pruning the tree crown to compensate for root zone damage due to construction operations. Construction pruning shall include a fertilization/insecticide program.
  3. Construction pruning shall comply with NAA Ref.1 for Class IV - Crown Reduction Pruning and ANSI Z133.1.
  4. For those trees remaining within construction zone to be protected, apply mulch to a depth of 6 inches within dripline radius around tree to reduce compaction and increase moisture retention. Mulch depth shall be feathered to grade at base of trunk. Remove protection mulch after completion of work as specified.
- E. Fertilization and Insect Spraying:
1. Treat root pruned and construction pruned trees with liquid fertilizer, dormant oil spray, and insecticide.
    - a. Liquid fertilizer shall be applied at a rate recommended by the manufacturer and as required by NAA Ref.2.
    - b. Apply dormant oil spray, at a rate recommended by the manufacturer, in early spring before buds begin to swell.
    - c. Apply insecticide spray twice to root pruned trees following application of dormant oil spray. Spray insecticide at rates recommended by spray manufacturer at intervals appropriate for effective insect control.
- F. Clearing Within Protection Areas:
1. Selective clearing within tree protection areas shall only be performed when and as directed by Corpus Christi Army Depot.
- G. Removal of Protection:
1. Except as otherwise indicated or requested by Corpus Christi Army Depot, temporary protection devices and facilities installed during course of the work shall be removed only after all work that may injure or damage trees and plants is completed.

END OF SECTION 02831





## 02000 - Site Work

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### SECTION 02850a

#### CONCRETE TIE AND BALLASTED TRACK

- 1.01 DESCRIPTION. This specification covers the furnishing and installation of ballast; installing precast concrete ties, rail fastenings, and continuous welded rail. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.02 QUALITY CONTROL.
- A. Source quality control: If ballast source or appearance change, test ballast gradation and visually inspect production site immediately before initially shipping first batch of ballast from that source and of that appearance.
  - B. Construction equipment: Subject to inspection and acceptance by the Contracting Officer.
    - 1. Ballast roller: Self-propelled, pneumatic-tired, and not lighter than nine tons.
    - 2. Ballast compactor: Vibratory, not lighter than 2 1/2 ton, and be capable of applying a dynamic load of nine tons. Ensure that control of compactor's tamping cycle will induce maximum uniform compaction.
    - 3. Ballast tamper: Production Type with a minimum of 16 squeeze- vibratory tamping shoes.
- 1.03 SUBMITTALS. Submit certified test results of ballast tests not less than 15 days before starting shipment.
- 2.0 PRODUCT
- 2.01 BALLAST: Crushed stone manufactured from granite or granite gneiss satisfying AREA specification for size No. 4, Ballast.
- 3.0 EXECUTION
- 3.01 INSPECTION
- A. Examine surface of subballast for compaction, smoothness and conformance to sections and elevations.
  - B. Examine exposed conduit, conduit stub-ups, and drainage fittings for conformance to vertical and horizontal positioning and required interface with surface-mounted electrical appurtenances.
  - C. Examine alignment and elevation of existing work for interface with work of this Section. Use bench marks and horizontal control points established by the Contracting Officer. Adjustments at interfaces with existing work, to produce alignment and elevations indicated for work of this Section, must be approved by the Contracting Officer before work of this Section is started.
- 3.02 PREPARATION



- A. Correct products found not to conform to positioning and interfaces.
- B. Correct subballast if subballast does not conform to indicated smoothness, sections, and elevations.
- C. Stake-out centerlines of track and curvature points. Set top of rail elevation markers.

### 3.03 INSTALLATION

- A. Initial ballast
  - 1. Uniformly distribute ballast over the subballast and firmly compact before distributing ties.
  - 2. Uniformly spread each lift of ballast within initial layer with not less than four passes of either a roller or compactor. Limit the depth of each compacted lift within the initial layer to four inches. Make top of initial layer not less than four inches below final ballast surface.
- B. Ties: Place primary track ties on 30-inch centers. Place secondary track ties on 33-inch centers.
  - 1. Place ties to ensure that bottom of each tie will bear fully on initial layer of ballast and be normal to track centerline.
  - 2. Arrange ends of ties containing contact rail bracket anchor inserts to be on contact rail side.
- C. CONTINUOUS WELDED RAIL (CWR):
  - 1. Remove ballast and debris from inserts and concrete ties before placing rail pads, CWR, and rail clips.
  - 2. Place CWR on the pads in accordance with accepted working drawings. Do not drag CWR over rail pads. Use no on-track equipment until CWR has been fastened to concrete ties.
  - 3. Install, anchor and field-weld CWR producing zero thermal stress in rail at 85 degrees F, plus five degrees F, or minus 10 degrees F. Anchor opposite rails at temperatures within five degrees F of each other.
  - 4. Anchor rails in ballasted track by installing rail clips and fastener insulators in accordance with concrete tie manufacturer's recommendations. Proceed with final rail anchoring in ballasted track only after track has been ballasted preventing tie movements caused by thermally induced force and until track has been initially raised, tamped, and aligned.

### 3.04 SURFACING AND ALIGNING: Place ballast in cribs and shoulders of track structures, and in quantities which will fill tie cribs and be sufficient for initial track raise and to hold track after initial track raise.

- A. Surface track without bending rail, straining joints, or damaging rail fastenings. Simultaneously tamp ballast on both sides of tie, from points 15 inches inside both rail centers to ends of tie. Limit each track lift to not more than four inches. Initially raise track to an elevation ensuring that a final raise of neither less than one inch nor more than three inches will be required to bring track to final elevation.



## 02000 - Site Work

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- B. After track has been initially raised and aligned, field-weld and anchor rails within specified zero thermal stress range. Remove damaged ties and fastenings, in the judgment of the Contracting Officer, during surfacing operation and install new ties and clips. Suspend surfacing when ambient temperature is hotter than 95 degrees F.
- C. Compact shoulders and cribs with a vibrator compactor acceptable to the Contracting Officer. At no additional expense to the Contracting Officer, remove at random a maximum of one percent of ties so that the Contracting Officer may inspect compaction of ballast beneath ties to determine tamping variables of each piece of tamping equipment, and to spot-check production work. Reinstall ties immediately after compacted ballast has been accepted.
- D. Complete final surfacing and aligning of track. Reslope fouled and disturbed subballast outside toe of ballast slope.

END OF SECTION 02850a



## SECTION 02850b

### TRACK CONTROL SURVEY MARKERS

- 1.01 DESCRIPTION: This specification covers the furnishing and installation of survey markers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.02 REFERENCED DOCUMENTS
  - Industry Standards: American Society for Testing and Materials (ASTM)
  - A307 Carbon Steel Externally Threaded Standard Fasteners
  - A615 Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
- 2.0 PRODUCTS
- 2.01 SURVEY MARKERS
  - A. Wall-mounted type
    - 1. Rail fastener insert: .
    - 2. Epoxy grout: DIRECT FIXATION TRACK.
    - 3. Extension rod: Carbon steel conforming to ASTM A307, and threaded to match insert threads.
    - 4. Stirrup: CONCRETE REINFORCEMENT.
    - 5. Concrete: Class 3000
  - B. Ground-set type
    - 1. Monument pad pipe: Schedule 40 PVC pipe. Cut ends of pipe square.
    - 2. Corrugated metal pipe: Galvanized, 12 gauge. Cut ends of pipe square; remove burrs.
    - 3. Concrete: Class 2500
    - 4. Sand: Clean.
- 3.0 EXECUTION
- 3.01 INSTALLATION
  - A. Wall-mounted type
    - 1. Core two-inch diameter hole 4-3/4 inches deep into wall. Center rail fastener insert in hole, flush face of insert with face of wall, and support insert. Pack grout around insert, and fill hole with grout.



## 02000 - Site Work

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2. After eight hour grout cure, remove insert support and install extension rod in insert. Install stirrups in accordance with CONCRETE REINFORCEMENT.
  3. Install formwork in accordance with CONCRETE FORMWORK.
  4. Place concrete in accordance with CAST-IN-PLACE CONCRETE.
- B. Ground-set type
1. Excavate, set monument marker pipe vertical, center on station and offset coordinates, and place concrete around pipe in accordance with CAST-IN-PLACE CONCRETE.
  2. Center corrugated metal pipe about monument marker pipe, fill annulus between the pipes with sand, and backfill.
  3. Fill monument marker pipe with concrete in accordance with CAST-IN-PLACE CONCRETE. Strike top of concrete smooth.

END OF SECTION 02850b



## SECTION 02850c

### HI-RAIL ACCESSES, TIMBER PANELS, AND GRADE CROSSINGS

- 1.01 DESCRIPTION: This specification covers the furnishing and installation of products for hi-rail accesses, timber panels, and grade crossings. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.02 REFERENCED DOCUMENTS
- A. American Society for Testing and Materials (ASTM)
    - A5 Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless
    - A153 Zinc Coating (Hot Dip) on Iron and Steel Hardware
    - A491 Asphalt Mastic (Asphalt Cement, Mineral Filler, Mineral Aggregate) for use in Waterproofing
    - A575 Steel Bar, Carbon Merchant Quality, M-Grades
  - B. American Railway Engineering Association (AREA): Manual for Railway Engineering, Chapter 3, Part 6
- 2.0 PRODUCTS
- 2.01 TIES: Timber type; 8 1/2 feet long except ties on which contact rail insulators will be mounted shall be ten feet long. Furnish ties which will be within limits of panels, and ties which will be not more than 10 feet beyond panels.
- 2.02 PANEL TIMBERS, FLANGWAY TIMBERS, AND SUPPORT BLOCKS: AREA Type A, fine-grained hardwood such as maple, gum, or birch and specially fabricated as indicated. Support blocks shall be fabricated from a single piece of timber.
- 2.03 HI-RAIL ACCESS: Panel timbers, flangeway timbers, and support blocks.
- 2.04 DRIVE DOWELS: Steel conforming to ASTM A575, twisted, of diameter not smaller than 3/4 inch.
- 2.05 DRIVE SPIKES: Dome head steel type, 3/4 inch diameter by 12 inches long, and galvanized in accordance with ASTM A153; Lewis Bolt and Nut Co., or accepted equivalent.
- 2.06 GUARD POSTS: Galvanized steel pipe conforming to ASTM A53, Grade B, four-inch diameter by eight feet long.
- 2.07 BALLAST PRIME COAT: Grade MC-250.
- 2.08 ASPHALT CONCRETE: ASPHALTIC CONCRETE.
- 2.09 CONCRETE: Class 3000 PORTLAND CEMENT CONCRETE





## 02000 - Site Work

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- 2.10 TIMBER SCREWS FOR ANCHORING RAIL FASTENERS
- 2.11 RAIL FASTENERS: L. B. Foster Co.'s, Transit Products Division, "Type H-10", or accepted equivalent.
- 2.12 TIE PLATES:
- 2.13 TRACK SPIKES:
- 2.14 GUARD RAILS: GUARD RAIL.
- 2.15 BALLAST: CONCRETE TIE AND BALLASTED TRACK.
- 2.16 AGGREGATE BASE: AGGREGATE.
- 2.17 NOT USED
- 2.18 FABRICATION: Fabricate timbers and blocks before pressure-treating.
  - A. Fabricate timbers to be eight feet long.
    - 1. Orient timber heartwood to be downward.
    - 2. Cut ends of timbers square except bevel distal ends of timbers, which will comprise the end panels, at 45 degrees.
    - 3. Cut timbers to dimension ensuring that top of installed panel is 3/4 inch below top of rail.
    - 4. Notch flangeway timbers to clear rail fastener and tie plate hardware by not less than 1/2 inch.
    - 5. Drill 5/8 inch diameter holes for drive spikes through timbers, and on 19 3/16-inch centers. Arrange adjacent holes to be on opposite sides of tie centerline.
    - 6. In hi-rail access timber panels, drill four, 5/8 inch diameter holes for drive dowels; drill parallel to center of timbers' vertical dimension. Holes shall be no closer to end of timbers than one foot, and remainder equidistant from each other.
  - B. Fabricate blocks to fit between rail fasteners and tie plates, and such that blocks will support notched portion of flangeway timbers.
  - C. Pressure-treat timbers and blocks in accordance with AREA Chapter 3, Part 6.
  - D. Assemble treated timbers into panels eight feet long, with heartwood downward and ends aligned with each other. Drive dowels.
- 3.0 EXECUTION
- 3.01 EXAMINATION: CONCRETE TIE AND BALLASTED TRACK.
- 3.02 PREPARATION: CONCRETE TIE AND BALLASTED TRACK.
- 3.03 INSTALLATION:
  - A. Place initial layer of ballast.
  - B. Distribute and place timber ties on 19 3/16-inch centers, with wider heartwood downward, normal to centerline of track, and aligned with ends of ties on line side of track equal distance from rail.



- C. Place aggregate base.
- D. Place and anchor rail fasteners and tie plates to timber ties with timber screws and track lock spikes
- E. Unload, lay, and join CWR; clip and spike CWR to rail fasteners and tie plates, and raise, align, and surface track to indicated lines, grades, and elevations.
- F. Dress ballast level one inch below top of ties and to slopes indicated.
- G. Drill 1/2 inch diameter holes into installed ties for drive spikes for a depth of five inches, immediately remove debris from holes, and fill holes with pentachlorophenol. Panels may be installed to facilitate the temporary access by hi-rail equipment, but shall be removed for grinding of the running rail.
- H. Place one-piece support blocks in space between ties and flangeway timbers, against base of rail, and between rail fasteners. Place panels on ties and support blocks, and arrange panels with ends coinciding with centers between the ties; butt ends of panels. Dap and saw flangeway timbers, panel timbers, and support blocks to satisfy field conditions within specified tolerances, and apply pentachlorophenol to dapped and sawed timbers and blocks. Insert no shims between panels and ties.
- I. Drive spikes vertically, and until spike head bears on timbers.
- J. Apply prime coat and asphalt concrete in accordance with ASPHALTIC CONCRETE.
- K. Apply asphaltic concrete between flangeway timbers and grade crossings in accordance with ASPHALTIC CONCRETE.
- L. Install crossing in accordance with crossing manufacturer's printed installation instructions.
- M. Install guard posts vertically and project posts three feet above top of rail; fill posts with concrete and crown top in accordance with CAST-IN-PLACE CONCRETE.
- N. Install guard rail in accordance with GUARD RAIL.
- O. Tolerances from design dimensions.
  - 1. Top of flangeway timber, vertical depression below top of rail: plus 1/4 inch, minus zero.
  - 2. Clearance between side of flangeway timbers and edge of rail: Plus 1/2 inch, minus zero.
  - 3. Difference in elevation between surface of flangeway timber and surface of abutting asphalt concrete: 1/4 inch.

END OF SECTION 20850c



## 02000 - Site Work

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### SECTION 02850d

#### DIRECT FIXATION RAIL FASTENERS

- 1.01 DESCRIPTION. This specification covers the furnishing and installation of direct fixation rail fasteners and anchorage. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.02 REFERENCED DOCUMENTS
- A. American Railway Engineering Association (AREA): Portfolio of track plans: Specification for Special Trackwork
1. Association of American Railroads (AAR): Signal Section 13-52, Part 58, Hard Fiber
  2. American Society for Testing and Materials (ASTM)
    - A36 Structural Steel
    - A148 High Strength Steel Castings for Structural Purposes
    - B633 Electrodeposited Coatings of Zinc of Iron and Steel
    - D395 Rubber Property - Compression Set
    - D412 Rubber Properties in Tension
    - D471 Rubber Property - Effect of Liquids
    - D518 Rubber Deterioration - Surface Cracking
    - D573 Rubber Deterioration in an Air Oven
    - D1149 Rubber Deterioration - Surface Ozone Cracking in a Chamber (Flat Specimen)
    - D1229 Rubber Property - Compression Set at Low Temperature
  3. Industrial Fasteners Institute's Standards (IFIS)
    - a. IFI 100
    - b. IFI 101
  4. National Electrical Manufacturers Association (NEMA): LI-1- 1971 Fiber Washers and Sleeves
  5. National Fire Protection Association (NFPA): No. 258-T, Smoke Generated by Solid Materials Test (1974)
- 1.03 QUALITY CONTROL
- A. Design criteria for special rail fasteners including anchorage
1. Function



- a. Secure and distribute loads of 115RE rail and special trackwork to concrete trackbed and timber ties.
  - b. Provide vertical and lateral stability to the rail.
  - c. Restrain rail from movement in longitudinal direction.
  - d. Dampen vibrations generated by moving wheels on the rail.
  - e. Electrically insulate rail from trackbed and timber ties.
2. Parts
    - a. Have as few components as economically and technically feasible to facilitate assembling disassembling and maintaining in the field by means of standard hand tools.
    - b. Rail fastener body shall consist of a 5/8 inch thick elastomer pad bonded to either a single steel plate or sandwiched and bonded between two steel plates, a rail fastening system for securing rail to fastener, and anchorage assemblies for anchoring rail and fastener assembly to fixed surfaces and for providing specific increments of lateral adjustments in rail alignments and track gauge. Top plate shall be no thinner than 1/2 inch and the bottom plate shall be no thinner than 3/16 inch.
    - c. Components of rail fastener body which may replace or be added to the basic configuration in order to laterally adjust the rail shall be clearly identified with respect to the increment of particular adjustment.
    - d. The rail fastening system or the means of preventing lateral movement of rail shall make point contact against rail. Contact area shall be at least one inch in length measured along the rail and not less than 0.15 square inch in area.
    - e. Spacers or bushings adjacent to anchor bolt holes shall be no larger than 1 3/8 inches in diameter for those fasteners with spring rates greater than 180,000 psi.
  3. Accommodation of rail removal: Design rail fastener to permit the release of rail fastening system so that rail may be removed by raising rail vertically until it is completely free of fastener without disturbing the horizontal or vertical alignment of the fastener.
  4. Type of anchorage assemblies
    - a. Embedded in concrete
      - (1) Anchor bolt: Steel conforming to SAE J429, Grade 5, 7/8 inch diameter, 9 UNC Class 2A threads electroplated with zinc in accordance with ASTM B633, Type III, SC2, and length sufficient to provide 1 1/4- inch thread engagement in insert;
      - (2) Washers: Self-locking type, 7/8 inch, steel; Disc-Lock, or accepted equivalent.
      - (3) Insert: Steel conforming to SAE J429, Grade 5, zinc electroplated in accordance with ASTM B633, Type III, SC2, 7/8 inch diameter, 9 UNC Class 2B internal threads and 1 1/2 inches of thread engagement for anchor bolt; female type, not longer than 4-1/2 inches, and have nonwelded collar and rotation prevention coupling nut; with nylon or plastic pull away type plug.



## 02000 - Site Work

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Bond threaded portion of insert coupling nut device to other portion of insert for depth of 7/8 inch with epoxy glue manufactured by the Lord Corp.

- b. Drilled in timber ties: Lag screw, steel, seven inches long with 7/8 inch diameter by 5/8 inch minimum length shoulder and washer-square head; Camcar Division of Textron Industries, Inc.'s 3/4-4 Torx, United Steel and Fasteners, Inc., or accepted equivalent.
- 5. Rail fastening system
  - a. Rail fasteners employing nonthreaded rail hold-down assemblies shall provide on each side of the rail base a positive means of preventing more than 1/8 inch total lateral movement of the rail base relative to the fastener, in event of failure or loosening of one or both hold-down assemblies. Fasteners which employ threaded elements in the rail hold-down assembly shall not permit more than 1/8 inch total lateral movement of the rail base relative to the fastener, when the threaded elements are finger tight.
  - b. Threaded elements
    - (1) Strength: ASTM A325 Type 1.
    - (2) Nominal diameter: 3/4 inch
    - (3) Thread: 9 UNC Class 2A fit
    - (4) Nut: Self-locking hex head threaded 9 UNC Class 2B fit, torque nut conforming to IFI-100 and IFI-101.
    - (5) Washer: Self-locking type, 3/4 inch, steel; Disc- Lock, or accepted equivalent.
    - (6) Bolt threads: Electroplated cadmium coated per ASTM A165 Type I.
- 6. Lateral rail adjustment
  - a. Design rail fastener so that lateral adjustment of rail for specified increments is made by a method which does not require substitution or addition of component to fastener.
  - b. Lateral movement of the anchor bolts in a slotted insert or lateral movement of the rail fastener relative to the anchor bolts shall not be used to achieve rail lateral maintenance adjustment requirements.
- 7. Rail restraint: Design fastener so that the longitudinal and lateral rail restraint properties of the fastener assembly shall be identical in both directions respectfully in all positions of the rail on the fastener.
- 8. Stability: Design fastener so that its stability in every direction is not dependent solely upon strength of bond of elastomer to metal.
- 9. Compressive strength of elastomer: Design fastener so that the compressive strain on the elastomer does not exceed 25 percent of its compressive thickness for a load of 15,000 pounds applied vertically to the rail in fully assembled fastener.
- 10. Bearing: Design rail fastener so that



- a. Fastener has full bearing on elastomer for each specified position of lateral adjustment.
    - b. Elastomer when installed in fastener assembly shall not be displaced under operating conditions.
  11. Bonding: Design rail fastener to have all exposed edge surfaces of metal parts adjacent to elastomer coated with the primer and material used to form the bond.
  12. Configuration: Design the rail fastener so that
    - a. The fastener assembly rail seat shall be steel, flat, continuous and shall impart no cant to rail. Underside of the fastener base is flat parallel to the plane of the rail seat and without projections into concrete or tie.
    - b. Distance as installed, from base of anchor hold-down bolt head to the base of the fastener shall not exceed 2-1/2 inches. The overall vertical distance between base of rail and base of fastener shall be at least 1-5/16 inches and not more than 1-1/2 inches.
    - c. Overall dimensions of the fasteners, including the elastomer, shall be not less than six inches nor wider than 10 inches measured parallel to the rail and vary in length, not shorter than 32 inches or longer than 48 inches measured normal to the rail.
    - d. Rail fastener shall be designed to provide for a minimum of two anchorage assemblies; sized to accommodate 7/8 inch diameter anchor bolts or timber screws, and centered and located on top plate not closer than two inches from each end of fastener.
    - e. Each rail fastener shall provide a means of lateral adjustment having a minimum range of plus or minus 1/2 inch in increments of 1/8 inch. Lateral or longitudinal stability of rail shall not be reduced in any adjusted position. Friction alone shall not be used as a means of adjustment.
    - f. Each rail fastener shall provide an electrical leakage distance of not less than 1/2 inch under all load conditions, measured from ground portion of fastener in direct contact with the rail by the most direct path that does not pass through insulating material.
    - g. Leakage distance path shall be without recesses or other geometric configurations capable of collecting and holding moisture, dust or other materials creating a conductive path to ground.
  13. Elastomer: Determine all dimensions affecting the shape of the elastomer in the rail fastener to ensure complete conformance to the specified physical requirements.
- B. Allowable deviations from indicated plate dimensions
1. Thickness: 1/32 inch.
  2. Straightness: Using a 36-inch straightedge oriented in directions 1/32 inch.
  3. Hole diameters: 1/32 inch.
  4. Hole centerline locations: 1/16 inch.



## 02000 - Site Work

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5. Deviation from straightness of edges of riser plates parallel and adjacent to base of rail: 1/32 inch.
6. Deviation from over-all planar dimensions: 1/8 inch.
- C. Testing of special direct fixation rail fasteners: In lieu of qualification testing of rail fastener assemblies, Contractor may submit for the Contracting Officer approval certification by a independent testing laboratory stating that fasteners have passed the tests specified in this Article or equivalent tests and that fasteners comply with design criteria as specified.
  1. Submit for the Contracting Officer approval prior to fabrication and testing, shop drawings detailing fasteners and detailed description of steps required for their complete installation as well as their replacement or individual components and detailed description of all tests.
  2. Arrange testing to be performed by a testing facility and in accordance with procedures approved by the Contracting Officer at no additional expense to the Contracting Officer. Production testing may be performed at Contractor's facility providing that facilities and testing procedures meet the approval of the Contracting Officer.
  3. All testing performed by Contractor shall be witnessed by a representative provided by the Contracting Officer.
  4. Method of selection: At random equal numbers of molded or post-bonded fasteners from the initial lot of 15 fasteners produced.
  5. Quantity of fasteners selected: Four each of either the molded or post-bonded fasteners. If additional fasteners are necessary they shall be furnished at no additional cost to the Contracting Officer.
  6. Visual inspection: Measure and examine each of the fasteners from the initial lot of fasteners produced for conformance with specifications and in compliance with the Contracting Officer approved shop drawings.
  7. Complete assembly test
    - a. Clean and dry components of test assembly.
    - b. Assemble one complete rail fastener and mount to a section of 115RE rail not shorter than one foot.
    - c. Mount test assembly on concrete block, having compressive strength of not less than 4,000 psi; secure test assembly to the block by the anchorage assembly as specified in DIRECT FIXATION TRACK, to simulate actual field installation.
    - d. Immediately prior to starting tests, stabilize temperature of fasteners at 68 degrees F, plus or minus four degrees F.
    - e. Perform testing only when ambient temperature is 68 degrees F, plus or minus four degrees F unless otherwise specified.
    - f. If a single rail fastener is unstable for test purposes, mount two complete fasteners on a section of 115RE rail not less than two feet long with not less than one inch longitudinal separation between the fasteners, and apply double the test load at a point midway between the two fasteners.



8. Sequence of tests on assembled rail fasteners: Four rail fasteners designated as fasteners A, B, C, and D shall be assembled and mounted as specified in Paragraph 1.02C7 and shall be subjected to the following sequence of performance tests.
  - a. Rail fasteners A, B, C, and D: Subject each rail fastener to the static tests specified in Paragraphs 1.02C10 through 1.02C16 and the Dynamic to Static Stiffness Ratio Test as specified in Paragraph 1.02C22. Rail fastener B shall then be subjected to the Corrosion Test as specified in Paragraph 1.02C23.
  - b. Rail fastener A: Subject rail fastener to the Vertical and Lateral Repeated Load Test as specified in Paragraph 1.02C17 and then retest rail fastener through each of the static tests specified in Paragraph 1.02C8a above, without replacement of any component. Do not disassemble rail fastener from the rail after the Repeated Load Test With One Anchor as specified in Paragraph 1.02C18 and do not reposition any rail clip.
  - c. Rail fastener B: Subject rail fastener to the Heat Aging Test as specified in Paragraph 1.02C19 and then retest rail fastener through each of the static tests specified in Paragraph 1.02C8a above, without replacing any component.
  - d. Rail fastener C: Subject rail fastener to the Heat Aging Test as specified in Paragraph 1.02C19, and then retest rail fastener as specified in Paragraph 1.02C20, Uplift Repeated Load Test. Retest rail fastener through each of the static tests specified in Paragraph 1.02C8a above, without replacing any component.
  - e. Rail fastener D: Subject rail fastener to the Push-Pull Test as specified in Paragraph 1.02C21, and then retest rail fastener through each of the static test specified in Paragraph 1.02C8a above, without replacing any component. For the Longitudinal Restraint Test, specified in Paragraph 1.02C14, rail fastener shall not be disassembled from the rail after the Push-Pull Test, nor shall the rail hold-down assemblies be repositioned.
9. Qualification failure: Should any fastener fail a test, the entire sequence of tests as specified in Paragraph 1.02C8 shall be performed on a new rail fastener of the same size. If the rail fastener must be modified to pass any tests, Working Drawings of the new rail fastener design shall be submitted for the Contracting Officer approval. A new lot of at least 15 rail fasteners, including at least four that are 32 inches or longer, of the new design shall be produced and all tests performed on the new rail fastener design. This cycle shall be continued until rail fasteners are approved, but no longer than four months after receipt of Notice to Proceed. The cost of all such additional testing of any component that does not comply with these Specifications, including expenses for witnessing tests by Contracting Officer's representative, shall be at Contractor's expense.
10. Vertical load test
  - a. Total test load: 15,000 pounds developed in increments of 1,000 pounds.
  - b. Point of application: Downward at centerline of the fastener normal to rail head.
  - c. Test procedure





## 02000 - Site Work

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- (1) For each load increment, measure continually and record immediately the vertical deflection of the rail head to the nearest 0.001 inch.
  - (2) Remove load and measure and record the final position of the rail head.
  - (3) Plot record values for vertical loads against deflection on a graph as shown in Exhibit E.
- d. Test acceptance criteria
- (1) Allowable envelope of load deflection curve: As indicated in Exhibit E for loads in the range between 5,000 pounds and 12,000 pounds for a load corresponding to a 122,000 pound vehicle.
  - (2) Slope of the load-deflection curve (spring rate of fastener): Not less than 120,000 pounds per inch nor more than 300,000 pounds per inch. Constancy of slope: Within 10 percent over the load range.
  - (3) Recovery of fastener to original position: within .005 inch within one minute.
  - (4) Stability: No movement of components caused by other than deflections, and no visual sign of failure by slippage, yielding, or fracture.
  - (5) Ratio of deflection to thickness of elastomer:  
Maximum value for initial test: 4 to 1 or 25 percent  
Basis of determination: the deflection measured at 15,000 pounds divided by thickness of elastomer in inches; not to exceed as 25 percent of elastomer thickness.  
Value for repeated tests on same fastener: within 20 percent of initial test values.
11. Vertical uplift test
- a. Test loads: Increasing in increments of 200 pounds alternated upward and downward, apply up to 2,000 pounds total uplift load.
  - b. Point of application: Center of the rail head along the centerline of the fastener.
  - c. Test procedure
    - (1) Continually measure and immediately record the loads and corresponding deflections to the nearest 0.001 inch on a load versus time graph, and a deflection versus time graph, respectively.
    - (2) Remove load, and measure and record the final position of the rail head.
    - (3) Apply reaction force to the concrete test block to which the fastener is anchored.
  - d. Test acceptance criteria
    - (1) Ratio of the deflection for the total uplift test load to the deflection for the total vertical downward test load: Shall not exceed 200 percent for special rail fasteners and between plus five percent and plus 125 percent for standard



rail fasteners of the deflection for a 2,000 pound downward vertical load as determined from the vertical load test.

- (2) Stability: No indication of backlash and freeplay when the vertical load is continuously varied from vertical upwards to vertical downwards.
- (3) Recovery of fastener to original position: within 0.005 inch within one minute after application of the 2,000 pound upward test load and again after application of the 2,000 pound downward test load.

12. Lateral load test

- a. Test load: Increasing in increments of 1,000 pounds apply up to 7,500 pounds horizontally to rail head while under a constant vertical load downward at center line of rail head of 13,500 pounds.
- b. Point of horizontal load application: 0.625 inch below top of rail along the centerline of the fastener normal to the rail.
- c. Test procedure
  - (1) Continuously measure and immediately record the lateral deflection of the rail head. Plot recorded values for lateral loads versus deflection on a graph similar to Exhibit E.
  - (2) Remove lateral load, and measure and record the final position of the rail head.
- d. Test acceptance criteria
  - (1) Maximum lateral deflection for 4,000 pounds lateral test load: 0.125 inch.
  - (2) Maximum lateral deflection for 7,500 pounds lateral test load: 0.30 inch.
  - (3) Maximum difference between original and final position of the rail head: 0.062 inch.
  - (4) Stability: No visual signs of failure by slippage, yielding or fracture during testing.

13. Lateral restraint test

- a. Set load: Lateral load increasing in increments of 500 pounds from zero to 2,500.
- b. Test loads: Two equal lateral loads increasing simultaneously in increments of 500 pounds from zero to 2,500.
- c. Point of application: Normal to and at base of rail, symmetrically on each side of the fastener centerline and within limits of fastener.
- d. Test procedure: Apply and release set load; set deflection indicators at zero; apply test loads; and measure and record, after each increment of loading, the deflection at the intersection of the centerline of the fastener and the gauge line of the rail to the nearest 0.001 inch.
- e. Test acceptance criteria
  - (1) Maximum lateral deflection of rail when fully loaded: 0.125 inch.



## 02000 - Site Work

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- (2) Maximum difference between the original and final positions of the gauge line: 0.062 inch.
  - (3) Stability: No visual signs of failure by slippage, yielding or fracture during testing.
- 14. Longitudinal restraint test
  - a. Rail end support: Roller or other frictionless support properly elevated to prevent the longitudinal load from binding the rail to the fastener.
  - b. Test load: Increments of 200 pounds increased to 10,000 pounds for special fasteners and 3,000 pounds for standard fasteners or until rail deflects 0.6 inch from its original position, whichever occurs first. The rate at which load is applied shall be between 100 and 1,000 pounds per minute.
  - c. Point of test load application: longitudinally to the rail as its centroid.
  - d. Duration per increment of test load: until longitudinal deflection of rail ceases.
  - e. Procedure
    - (1) Mark rail and rail clip at a point common to both.
    - (2) Measure and record the longitudinal deflection for each load to the nearest 0.001 inch.
    - (3) Remove the longitudinal load and measure and record the final position of rail.
    - (4) Plot the recorded values for longitudinal loads against deflection as shown on Exhibit F.
  - f. Test acceptance criteria
    - (1) Envelope for longitudinal loads against deflection curve: as indicated on Exhibit F, for standard rail fasteners only.
    - (2) Difference between original and final rail position: not more than 0.125 inch, plus slippage between rail clip and rail.
    - (3) Stability: no visual yields, fractures, bond failures, and slippages during and after test, except slippage that may occur between rail clip and rail.
- 15. High voltage withstand test
  - a. Effect of high voltage on quality of elastomer
    - (1) Procedure: Place ground plate between rail fastener and concrete test block. Apply a DC potential of 15KV between rail head and ground plate for one minute.
    - (2) Acceptance criteria: neither cracks, pinholes, electrical flashover, or arcing nor fracture to occur.
- 16. Electrical resistance and impedance test
  - a. Dry resistance:



- (1) Remove moisture, if any, from rail fastener assembly and with one lead of high potential tester connected to rail head and ground lead connected to anchor bolt, apply 500 volts DC for three minutes. Use the current value obtained to calculate resistance.
    - (2) Acceptable resistance to 500 volts DC: not less than 10 megohms.
  - b. Wet resistance:
    - (1) Release ground plate, rail fastener, and anchorage assembly from concrete test block and rail; immerse rail fastener in distilled water for 70 hours at 100 degrees C for neoprene based elastomers and for 336 hours at 70 degrees C for natural rubber based elastomers.
    - (2) After rail fastener has been removed from water without drying and with no portion of the rail fastener cooler than 35 degrees C, reassemble and anchor ground plate, rail fastener, and rail on the concrete test block.
    - (3) Connect one lead of high potential tester to rail head and ground lead to anchor bolt, apply 500 volts DC for three minutes and test for electrical resistance. Use current value obtained to calculate resistance.
    - (4) Allowable resistance: not less than one megohm.
  - c. Wet impedance:
    - (1) With the rail fastener assembly still wet and with no portion of the assembly cooler 35 degrees C, apply a potential of 50 volts AC between rail head and grounded anchor bolt.
    - (2) After reading has stabilized for 30 seconds, measure impedance frequencies of 1,000; 2,000; 4,000; 6,000; 8,000; and 10,000 hertz within an accuracy of plus or minus two percent and recorded for each frequency.
    - (3) Impedance for frequencies between 20 Hz and 5 kHz with 50 volts AC shall be 10,000 ohms; at 6 kHz shall be 9,000 ohms, at 8 kHz shall be 7,000 ohms, and at 10 kHz shall be 6,000 ohms.
17. Vertical and lateral repeated load test
  - a. Procedure:
    - (1) Apply test loads to the rail head, so as to produce a vertical downward load of 13,500 pounds and lateral loads 0.625 inch below top of rail and along the centerline of the rail fastener normal to the rail of 4,900 pounds to the gauge side and 3,200 pounds to the field side.
    - (2) Alternate the lateral loads and combine with alternated application and release of the vertical load for a total of three million complete cycles. (One cycle consists of one application each of the lateral field side load and of the gauge side load and two applications of the vertical load).
    - (3) Regulate the frequency to prevent the temperature of the components from exceeding 70 degrees C.



## 02000 - Site Work

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- (4) Do not retorque the threaded elements subsequent to the completion of 500,000 cycles of loading without written approval of the Contracting Officer.
    - b. Acceptance criteria:
      - (1) Minimum cycles of test load application with no visual evidence of failure: Three million.
      - (2) Allowable visual failure by slippage, yielding abrasion, or fracture at any time during the test: None.
18. Vertical and lateral repeated load test with one anchor test
  - a. Procedure
    - (1) After completion of Vertical and Lateral Load Test as specified in Paragraph 1.02C17, reassemble rail fastener using only the original components subjected to testing.
    - (2) Apply the Vertical and Lateral Repeated Load Test with gauge side anchor bolt removed for 15,000 cycles.
  - b. Acceptance criteria: minimum cycles of application with no visual evidence of failure by slippage, yielding or cracking: 15,000 cycles.
19. Heat aging procedure
  - a. Test specimen: fully assembled rail fastener, except that the anchor bolts need not be installed.
  - b. Procedure: age test specimen in an air oven for a period of 70 hours at a temperature of 100 degrees C in accordance with ASTM D573.
  - c. Acceptance criteria: none, the purpose being to age the rail fastener for additional testing.
20. Uplift repeated load test
  - a. Test loads
    - (1) Apply loads to the rail head so as to produce a vertical downward load of 12,000 pounds and a vertical upward load of 2,000 pounds at the centerline of the fastener in a direction normal to the rail.
    - (2) Longitudinal load: starting at 100 pounds and increasing in increments of 100 pounds up to a maximum load of 600 pounds, at interval of not less than one increment per 100 cycles of vertical loading.
  - b. Test procedure:
    - (1) Alternate the upward and downward loads for 1.5 million cycles.
    - (2) Regulate the frequency to prevent the temperature of components of the test specimen from reaching 70 degrees C.
    - (3) Do not retorque threaded elements subsequent to 500,000 loading cycles without written approval of the Contracting Officer.



- (4) During the final 500,000 loading cycles of vertical loading, apply the longitudinal load at centroid of rail as specified above and apply the vertical load at a rate of not less than 25 cycles per minute.
      - (5) For each load increment, measure the longitudinal deflection of the rail to the nearest 0.001 inch and record.
      - (6) Remove the longitudinal load and measure and record the final position of the rail. Plot the recorded values for the longitudinal load versus deflections on a graph similar to Exhibit F.
    - c. Test acceptance criteria:
      - (1) The rail fastener shall withstand 1.5 million cycles of load application with no evidence of failure.
      - (2) Upon visual inspection, no component of the rail fastener shall exhibit any evidence of failure by yielding, abrasion, or fracture.
      - (3) The rail shall exhibit no visual evidence of wear or grooving that would contribute to a failure of the rail.
      - (4) The plot of the loads versus deflections for the longitudinal load portion of the test shall show that movement of the rail was due to the elastic deformation and not slippage of the rail through the rail fastener.
21. Push-pull test:
  - a. Test load: 4,000 pounds cycling longitudinally or sufficient load to move rail plus or minus 1/8 inch.
  - b. Points of application: Centroids of the rail at both ends.
  - c. Procedure:
    - (1) Push and pull with the test load for one million complete cycles.
    - (2) Repositioning or retorquing of the rail hold-down assembly will be allowed after every 250,000 cycles but not for the last 250,000 cycles.
  - d. Test acceptance criteria: rail fastener shall withstand one million cycles of loading with no evidence of failure. Upon visual examination no component of the rail fastener shall exhibit any evidence of failure by yielding, abrasion, slippage or fracture. The rail shall exhibit no evidence of wear or grooving contributing to a failure of the rail.
22. Dynamic to static stiffness ratio test
  - a. Initial static vertical downward test load: 5,000 pounds to deflect the fully assembled fastener 0.03 inch.
  - b. Rate of application: 10 cycles per second.
  - c. Procedure:
    - (1) Apply initial dynamic vertical downward test load to the rail head over the centerline of fully assembled rail fastener for 1,000 cycles.



## 02000 - Site Work

- (2) Increase the dynamic test load in increments 1,000 pounds to 12,000 pounds maximum. Record the dynamic load corresponding to each load increment.
  - (3) Immediately after completing the dynamic load measurements, measure and record the static deflection of 3,000-pound increments for loading of 5,400 pounds to 12,000 pounds. Allow rail fastener to stabilize for at least one minute before each increment of testing is applied.
  - (4) Measure the deflections within an accuracy of 0.005 inch, and measure the test loads within an accuracy of 2.5 percent.
  - d. Test acceptance criteria: The dynamic and static stiffness shall each be calculated by dividing the difference between each increment of recorded loads by the respective difference between each increment in recorded deflections. The ratio of dynamic to static stiffness shall then be determined by dividing the mean of dynamic stiffness by the means of the static stiffnesses. The ratio shall not exceed 1.5 for neoprene and 1.4 for natural rubber.
23. Corrosion test
- a. Test procedure: Rail fastener body unit without loose components shall be exposed to a five percent chloride solution per ASTM B117 for 1,000 hours.
  - b. Test acceptance criteria: There shall be no loss of adhesion from this test at any elastomer and steel boundary deeper than 1/8 inch nor shall there be pitting or corrosion depressions deeper than 1/16 inch measured from plane of the affected surface.
24. Elastomer
- a. General: Have elastomers certified by an independent testing laboratory approved by the Contracting Officer to possess the physical properties specified in the following tabulation as determined by the respective ASTM specifications identified therein.
    - (1) Test material: Two specimens certified by the accepted independent testing organization to have been taken from a batch of compound used for producing the elastomer component of the fastener and having the same quality cure equivalent to the quality cure of the elastomeric component.
    - (2) Test preconditioning: Not less than seven days at 23 degrees C, at 50 percent relative humidity.

- b. General test requirements for all elastomer materials:

Test	ASTM Designation	Requirements
Durometer hardness (Shore A)	D2240	50 plus or minus five
Ultimate elongation	D412	350 percent minimum
Compression set at minus	D1129	60 percent



10 degrees C. for 70 hours to determine percent compression set 30 minus after release of test load

maximum

Resistance of ozone cracking of specimens prepared in accordance with Procedures A of ASTM D518 and subjected to 40 degrees C for 100 hours in 50 PPM ozone concentration

D1149

No cracking

Change in Durometer hardness

D573

10 points maximum

Adhesion of metal test

D429  
Method B

Elastomer tears before

Flame propagation index (Is)

E162

Acceptance criteria not specified but report test results to Engineer.  
Allowable drippings: none

Smoke generation

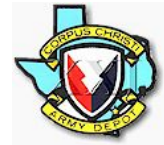
NFPA No. 258-T

Acceptance criteria not specified but report test results to Engineer.

c. Neoprene elastomer, additional test requirements:

Test	ASTM Designation	Requirements
High temperature compression set after 22 hours at 100 degrees C	D395 Method B	35 percent maximum
Tensile strength	D412	1,500 psi minimum
Accelerated aging after 70 hours at 100 degrees C		
Decrease in tensile strength	D573	15 percent maximum





## 02000 - Site Work

	Decrease in ultimate elongation	D573	40 percent maximum
	Oil absorption test at 100 degrees C for 70 hours		
	ASTM Oil No. 3	D471	100 percent maximum
	ASTM Oil No. 1	D471	Minus 10 plus 20 percent
d.	Natural rubber elastomer, additional test requirements:		
	Test	ASTM Designation	Requirements
	High temperature compression set after 22 hours at 70 degrees C	D395 Method B	25 percent maximum
	Tensile strength	D412	3000 psi minimum
	Accelerated aging 70 hours at 100 degrees C		
	Decrease in tensile strength	D573	25 percent maximum
	Ultimate elongation	D573	25 percent maximum
	Change in hardness, measured on the Duro-meter A Scale		10 points maximum
	Oil absorption volume change at 100 degrees C for 70 hours		
	ASTM No. 3 Oil	D471	100 percent
	ASTM No. 1 Oil	D471	Minus 10 percent plus 20 percent

- D. Production and production testing: Upon the Contracting Officer approval of qualification testing as specified in Paragraph 1.02C, the Contractor shall begin production of the fasteners. The qualification testing described in Paragraph 1.02C shall serve as the production testing. Contractor shall certify that all rail fasteners produced were manufactured in the same manner as the rail fasteners subjected to the Qualification Testing and that the manufacturing process used for producing each rail fastener is the same. Upon submittal of certification the entire lot of rail fasteners will be released by the Contracting Officer for shipment from the Contractor's facility.



- E. Identification: Mark subsequential lot number, Contractor's name or trademark, and consecutive numbers on each size of rail fastener in a permanent manner.
- 1.04 PRODUCT DELIVERING, STORING, AND HANDLING: Package components required for all special trackwork specified.
- 1.05 JOB CONDITIONS:
  - A. Provide proper care, maintenance, and condition of rail fasteners installed prior to final acceptance.
  - B. Complete installation of rail fasteners prior to operation of work trains.
- 2.0 PRODUCTS
- 2.01 MATERIALS: As required to satisfy the specified design criteria.
- 3.0 EXECUTION
- 3.01 MANUFACTURE, TEST, AND DELIVER RAIL FASTENER ASSEMBLIES: As specified and in accordance with the accepted shop drawings.

END OF SECTION 02850d



## SECTION 02850e

### RESILIENTLY SUPPORTED TRACK

- 1.01 DESCRIPTION: This specification covers the furnishing and installation of resiliently supported track at-grade, and continuous welded rail. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.02 REFERENCED DOCUMENTS
- A. American Railway Engineering Association (AREA): Manual for Railway Engineering (MRE): Chapter 10, Concrete Ties
  - B. MARTA Specifications
    - 02XS CONTINUOUS WELDED RAIL
    - 03CA CONCRETE FORMWORK
    - 03EA CONCRETE REINFORCEMENT
    - 03KA PORTLAND CEMENT CONCRETE
    - 03MACAST-IN-PLACE CONCRETE
- 1.03 QUALITY CONTROL:
- A. Testing of Resiliently Supported Two-Block Concrete Tie Assembly: In lieu of qualification testing of two-block concrete tie complete with resilient supports and rail fastening assemblies in accordance with Flexural Strength Testing of two-block ties in AREA MRE Chapter 10, Section 1.10 and tests for Noise and Vibration Performance as specified in this Section, Contractor may submit for the Contracting Officer approval certification by an independent testing laboratory that ties, supports, and rail fastenings have passed the tests specified or equivalent tests.
    - 1. Submit for Contracting Officer approval, prior to fabrication and testing, shop drawings detailing two-block concrete ties, resilient supports, and rail fastenings; detailed description of steps required for complete installation, replacement and adjustment of individual components; and detailed description of all tests.
    - 2. Arrange testing to be performed by an independent testing agency approved by the Contracting Officer. Production testing may be performed at Contractor's facility providing that facilities and testing procedures meet the approval of the Contracting Officer.
    - 3. All testing performed by Contractor shall be witnessed by the Contracting Officer.
    - 4. Qualification tests for Noise and Vibration Performance.
      - a. Test assembly



- (1) Except as otherwise specified herein, perform tests on a single concrete tie block complete with resilient supports, and rail fastening assembly certified to be identical to those to be furnished. Single concrete tie block shall be cut from a complete two-block tie assembly by cutting in half the tie bar joining the tie blocks.
  - (2) Cast or grout two-block tie and single tie block complete with resilient supports in a Class 4000 concrete foundation block as specified.
  - (3) Assemble a section of 115 RE rail not shorter than one foot, rail pad, and rail fastenings to two-block tie. Torque or drive rail fastenings in same manner and with the same force or torque as specified.
  - (4) Immediately prior to starting tests, stabilize temperature of all components of the assembly at 68 degrees F, plus or minus four degrees F.
  - (5) Perform testing only when ambient temperature is 68 degrees F, plus or minus four degrees F unless otherwise specified.
- b. Sequence of tests on assembled resiliently supported two-block concrete tie.
- (1) Static vertical stiffness test
    - (a) Vertical test load: Zero to 15,000 pounds, applied at a steady rate of 2,000 pounds per minute with optional 30-second pauses at every 1,000-pound increment.
    - (b) Point of application: Downward at and normal to centerline of rail and centerline of tie block.
    - (c) Test procedure
      - i. Preconditioning and seating loading: Apply vertical load varying at a rate of 2,000 pounds per minute from zero to 15,000 pounds and back to zero load. Set the deflection reading devices at zero one minute after load returns to zero pounds.
      - ii. For each 1,000-pound load increment, measure and record vertical deflection of the rail head to the nearest 0.001 inch 30 seconds after rail head has stopped moving.
      - iii. Upon completing measuring and recording vertical deflection of the rail head at 15,000 pounds nominal load, commence reducing the load at the same rate that was used for loading and record vertical deflections of the rail at 1,000-pound load reduction increments. One minute after reaching zero load on rail, measure and record the residual deflection of the rail.
      - iv. Average the two sets of vertical deflection readings for determining the normal deflections of the rail. Plot the normal deflections against the record values for vertical loads.
      - v. Calculate the vertical static stiffness of the resiliently supported two-block assembly by dividing the measured difference in static force between nominal values of 7,000 and 8,000 pounds by the measured difference in the average static deflection at 7,000 and 8,000 pounds.



## 02000 - Site Work

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- (d) Test acceptance criteria
  - i. Slope of the load-deflection curve: Not less than 50,000 pounds per inch nor more than 90,000 pounds per inch for all loads between 5,000 pounds and 15,000 pounds. Constancy of slope: Within 10 percent over the load range.
  - ii. Recovery of tie block to original rail-head position: Within 0.015 inch of its pre-test position within one minute after test load has been removed.
- (2) Dynamic vertical stiffness test
  - (a) Vertical test load: Sinusoidal force with a zero-to-peak amplitude of 500 pounds and a frequency of six Hertz, superimposed on a static compressive force of 7,500 pounds.
  - (b) Point of application: Downward at and normal to centerline of rail and centerline of tie block.
  - (c) Points on rail for measuring deflections: Two along centerline of rail and equidistant from point of load application.
  - (d) Measurement technique: Measure vertical force with a device capable of long term DC response to force, such as a strain gauge load cell. Measure vertical deflection with two identical linear variable differential transformer (LVDT) displacement gauges located symmetrically about the line of vertical force application. Locate displacement transducers above or below rail. Indicate DC force with a device capable of DC response without interference from the dynamic force component, such as an oscilloscope, oscillograph, or meter with long averaging time. Indicate the dynamic force and displacement with a device capable of detecting a six Hertz signal, but not responding to or compensating for DC signals, such as an oscilloscope, oscillograph or low frequency AC coupler meter.
  - (e) Test procedure
    - i. Apply a constant vertical compressive force of 7,500 pounds to the top of the rail, centered over the rail and the centerline of the single tie block. After the constant force has been established, superimpose on it a sinusoidally varying six Hertz force with a zero-to-peak amplitude of 500 pounds.
    - ii. Observe and document the DC and AC components of the force and the AC component of the deflection to an accuracy of plus or minus three percent.
    - iii. Calculate the dynamic stiffness of the single tie block at a static compressive force of 7,500 pounds by dividing the measured peak-to-peak force by the measured peak-to-peak deflection.
  - (f) Test acceptance criteria: Dynamic vertical stiffness shall be not less than 300,000 pounds per inch nor more than 500,000 pounds per inch.
- (3) Static lateral stiffness test



- (a) Vertical preload: Apply a constant force of 7,500 pounds through the centerline of rail and centerline of tie block with a fixture not restraining or causing lateral motion of the tie block or imposing lateral forces in excess of two percent of the maximum lateral test force.
- (b) Lateral test load: Zero to 7,500 pounds, applied at a steady rate of 1,000 pounds per minute with optional 30-second pauses at each 500-pound increment. One complete test cycle shall be run using a compressive load on the tie bar, and one complete test cycle shall be run with a tensile load on the tie bar.
- (c) Point of application: Apply lateral test loads to the projecting end of the cut tie bar, with the line of action of the force along the centroid of the lower horizontal leg of the tie bar. Rollers or large radius linkages may be used to restrain motion of the tie bar caused by the eccentricity of the line of action of the force with the area of the boot resisting the lateral force. However, the means of restraint must not interfere with the deflection of the tie block under the vertical preload or the lateral deflection of the block.
- (d) Points on tie block for measuring deflections: Measure deflection of tie block at a point on the end of tie block opposite tie bar, one inch above top of boot in the unloaded position, and on centerline of tie block.
- (e) Test procedure
  - i. Apply 7,500-pound vertical preload downward through center of rail at the centerline of tie block. Adjust linkages or rollers to prevent excessive motion of the tie bar normal to the line of action of the lateral force.
  - ii. To precondition and seat tie and boot assembly, apply a lateral load varying from zero to 7,500 pounds and immediately return to zero at a rate of 1,000 pounds per minute. Zero lateral deflection reading devices one minute after the lateral load returns to zero pounds and immediately commence test.
  - iii. Apply lateral load to the tie bar at a constant rate of 1,000 pounds per minute. If non-recording instrumentation requires pauses in loading to read instruments, stop loading at each 500-pound increment, read instruments 30 seconds after stopping loading and immediately resume loading.
  - iv. Upon reading the load and deflection of the rail at 7,500 pounds lateral load, reduce lateral load to zero, then reduce vertical preload to zero.
  - v. If data was manually read, record data points on a graph of lateral deflection as a function of load.
  - vi. Calculate lateral static stiffness of the single tie block, boot and pad assembly by dividing the measured difference in static force between nominal values of 3,000 and 4,000 pounds by the measured difference in static deflection at 3,000 and 4,000 pounds.

- vii. The nominal static lateral stiffness of a complete resiliently supported tie assembly is equal to the sum of stiffnesses measured under compression and tension of the tie bar.
- (f) Test acceptance criteria
  - i. Lateral stiffness with lateral load applied from gauge side: 120,000 to 170,000 pounds per inch.
  - ii. Lateral stiffness with lateral load applied from field side: 165,000 to 170,000 pounds per inch.
- (4) Water absorption of tie pad test:
  - (a) Test procedure: ASTM D1056
    - i. Cut two 29 mm diameter samples of the pad used between the bottom of the tie and the elastomer boot from two different pads and weigh them to an accuracy of plus or minus one percent. This weight is designated as P0 for each pad in the following formula.
    - ii. Immerse the samples in distilled water at room temperature, and hold them 50 mm below the surface with a wire probe or cage.
    - iii. Decrease the pressure in the atmosphere above the water to 635 mm of mercury.
    - v. After three minutes at the reduced pressure, return the pressure above the water to ambient atmospheric pressure.
    - vi. After three minutes at ambient atmospheric pressure, remove samples from water, superficially dry surfaces by gentle blotting without squeezing samples and weigh them to an accuracy of plus or minus one percent. This weight is designated as P1 for each pad in the following formula.
    - vii. Calculate the percentage change in weight of each sample using the formula:
$$A = 100(P1 - P0)/P0 \text{ percent}$$
  - b) Test acceptance criteria
    - i. Weight change due to water absorption: not more than 0.10 grams
    - ii. Volume change due to water absorption: not more than 0.10 grams
- (5) High voltage withstand test: effect of high voltage on quality of tie pad material.
  - (a) Test Procedure: Place a metal ground plate between concrete test block and tie pad. Apply a DC potential of 15KV between rail-head and ground plate for one minute.
  - (b) Test acceptance criteria: Neither cracks, pin-holes or electric flash over or arcing nor fracture to occur.
- (6) Electrical resistance and impedance test



- (a) Dry resistance:
  - i. Remove moisture, if any, from concrete tie block assembly and with one lead of high potential tester connected to rail head and ground lead connected to rail fastening system, apply 500 volts DC for three minutes. Use the current value obtained to calculate resistance.
  - ii. Acceptable resistance to 500 volts DC: not less than 10 megohms.
- (b) Wet resistance:
  - i. Release ground plate, tie pad, and rail fastening system from concrete tie block and rail; immerse tie pad in distilled water for six hours at 100 degrees C for neoprene based elastomers and for 336 hours at 70 degrees C for natural rubber based elastomers.
  - ii. After tie pad has been removed from water without drying and with no portion of the concrete tie block assembly cooler than 35 degrees C., reassemble ground plate, tie pad, rail fastening system, and rail on the tie block and test for electrical resistance as follows:

With one lead of high potential tester connected to rail head and the other lead ground to rail fastening system, apply 500 volts DC for three minutes, and test for electrical resistance. Use current value obtained to calculate resistance.

Allowable resistance: Not less than one megohm.
- (c) Wet impedance:
  - i. With the rail tie pad and rail fastening system still wet and with no portion of the concrete tie block assembly cooler than 35 degrees C, apply a potential of 50 volts AC between rail head and grounded rail fastening system until reading has stabilized for 30 seconds of measurement for frequencies 1,000, 2,000, 4,000, 6,000, 8,000, and 10,000 Hertz.
  - ii. After reading has stabilized for 30 seconds, measure impedance of each frequency within an accuracy of plus or minus two percent and record each frequency.
  - iii. Impedance for frequencies between 20 Hz and 5 kHz with 50 volts AC shall be 10,000 ohms, at 6 kHz shall be 9,000 ohms, at 8 kHz shall be 7,000 ohms, and at 10 kHz shall be 6,000 ohms.

- B. Construct a complete demonstration section of resiliently supported track not shorter than 50 track feet; construct within trackway and where required by Contracting Officer. Section constructed to specified tolerances will become a part of the permanent track; otherwise, remove section and construct another section until constructed as indicated.

## 2.0 PRODUCTS

- 2.01 TIES: Concrete and steel two-block type; either Nucor Corp.'s Nucor-VSB conforming to Drawing No. 2001/02/135.50, Stedef Inc.'s Stedef-VSB conforming to PRORAIL's Drawing A2122, or accepted equivalent.





## 02000 - Site Work

- 2.02 RAIL-FASTENING SYSTEM: Either Nucor Corp.'s S75 Fastenings, Stedef Inc.'s A. P. Fastening System, conforming to PRORAIL Drawing A2122, or accepted equivalent.
- 2.03 RESILIENT SUPPORT
- A. Tie boot and pad: Conform to either Nucor Corp.'s S75, Stedef Inc.'s Technical Specification No. S120-4, and PRORAIL's Drawing A2122, or accepted equivalent.
1. Rubber boot with microcellular pad.
  2. Tie pad: closed-cell cellular neoprene or elastomer.
  3. Boot restraints: Either a rigid support that will engage lip of boot on both sides of the rail or a series of rubber bands or plastic strapping of size and strength which will restrain applied boot against sides and bottom of tie without noticeable sag and without compressing tie pad.
- B. Rail pad: Rubber; nine millimeters thick; have longitudinal grooves; conform to either Nucor Corp.'s S75; International Union of Railways' Technical Specifications 864-5-0, Stedef Inc.'s Technical Specifications No. S120-OB and PRORAIL's Drawing A2122; or accepted equivalent.
- 2.04 CONCRETE REINFORCEMENT: CONCRETE REINFORCEMENT.
- 2.05 CONCRETE FORMWORK: CONCRETE FORMWORK.
- 2.06 CONCRETE: Class 4000 PORTLAND CEMENT CONCRETE.
- 2.07 Not Used
- 2.08 SUPERELEVATION TAGS: Brass or anodized aluminum; 1-1/4 inches wide by two inches long by 0.050 inch thick; and stamped with numerals 3/4 inch high, except that numerals for fractions shall be 3/8 inch high.
- 3.0 EXECUTION
- 3.01 PREPARATION: Establish track offset reference line, and chisel reference line mark on slab at intervals of not more than 20 feet. Along curved sections of track, chisel offset reference line mark at intervals to ensure that distance between chord drawn between two marks and indicated curve reference line will be not more than 0.005 foot.
- 3.02 INSTALLATION
- A. Space two-block ties perpendicular to track centerline, and on 30-inch centers, plus or minus one inch except at insulated joints. Place two-block ties at insulated joints as indicated within plus or minus 1/2 inch.
- B. Place rail pads between shoulders on concrete ties.
- C. Place rail on rail pads; do not disturb ties when connecting rails and fastening rail to ties. Torque or drive rail fastenings in accordance with manufacturer's printed instructions.
- D. Raise track, and support and block track to its final line and grade. Secure to hold track at final line and grade during concrete placement. Support assemblage only from base of rail. Conform track to required position.



1. Completely brace and support track section to be concreted at one time. Support track for not less than 100 feet beyond that track section being concreted, to ensure that track section will not be stressed.
  2. Install reinforcement in accordance with CONCRETE REINFORCEMENT.
  3. Install formwork in accordance with CONCRETE FORMWORK.
  4. Immediately before installing boot and tie pad, ensure that no water is in boot. Apply boot restraints to each tie without scratching and tearing boot and pad; ensure that boot and tie pad fit flush against sides and bottom of tie.
  5. Ensure that ties are normal to centerline of track. If tie needs to be adjusted to be perpendicular to track centerline, loosen rail-fastening system, align tie, and retighten or redrive rail-fastening system.
  6. Before placing concrete, survey and verify final line and grade on raised and supported track comply with established controls.
  7. Place concrete in accordance with CAST-IN-PLACE CONCRETE.
  8. Ensure that there is no concrete spillage on ties, lip of boots, rail fastenings, and inside boot.
- E. After concrete has been placed for not less than four hours, loosen rail fastenings to prevent thermal stresses in rail.
- F. Remove track supports and formwork and cleanout drainage chases and blockouts.
- 3.03 JOINTING AND ANCHORING RAIL: CONTINUOUS WELDED RAIL.
- 3.04 INSTALLING SUPERELEVATION TAGS: Install tags on concrete ties one foot inside superelevated CWR, and orient tag to be read in ascending order from tangent to spiral, through spiral to curve.
- A. Wire brush attachment surfaces and remove all loose material from concrete surfaces.
- B. Wire brush back side of tags, apply epoxy to tags, and press tags onto concrete ties at beginning and ending points of curved track and at elevation increments of 1/4 inch within spirals.
- 3.05 FINAL ALIGNMENT AND TRACK INSPECTION: CONTINUOUS WELDED RAIL.
- END OF SECTION 02850e



## 02000 - Site Work

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### SECTION 02850f

#### CONTINUOUS WELDED RAIL

- 1.01 DESCRIPTION: This specification covers the furnishing and installation of continuous welded rail, and continuous welded rail. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.01 REFERENCED DOCUMENTS
- A. Industry Standards
    - 1. American Railway Engineering Association (AREA): Manual for Railway Engineering (MRE): Chapter 4, Part 2, Specifications.
    - 2. Du-Wel Steel Products Co.'s "Boutet Process Quick Preheat Welding Procedures".
    - 3. Federal Specifications (FS): TT-P-645, Primer, Paint, Zinc Chromate, Alkyd Type.
- 1.02 QUALITY CONTROL: Construction Equipment: Subject to inspection and acceptance by the Contracting Officer. Track equipment shall satisfy clearance requirements of Exhibit G of this Section, and shall have tapered wheels and a wheel gauge of 56-11/16 inches.
- A. Rail tester: Automation Industries, Inc., Sperry Div.'s SRS Car 802, or accepted equivalent.
  - B. Rail grinder: Rail-mounted, self-propelled, high-speed type capable of removing at least 0.001 inch of metal per pass after track has been installed; Fairmont Railway Motors, A Division of Harsco Corp.'s RGC-24-A-1, or accepted equivalent. Diameter of grinding wheel shall be not smaller than 10 inches. Downward pressure of grinder shall be controllable to the extent that more metal may be removed per pass at high spots and that low spots shorter than five inches may be bridged.
  - C. Track geometry car: Capable of measuring deviation from track construction tolerances indicated in Exhibit H of this Section, and of recording those deviations; System Sciences Inc.'s EM-25 Hy-Rail Geometry Car, or accepted equivalent.
- 2.0 PRODUCTS
- 2.01 TAGS: Brass or anodized aluminum; 1-1/4 inches wide by two inches long by 0.050 inch thick; and stamped with numerals 3/4 inch high, except that numerals for fractions shall be 3/8 inch high.
- 2.02 ADHESIVE FOR BONDING TAGS TO CONCRETE: Either Tru Loc United of Dublin's TRU LOC Epoxy No. 135, or DevCon Corp.'s 2-Ton Clear Epoxy Stock No. 14310, or accepted equivalent.
- 2.03 PAINT: Yellow alkyd primer; FS TT-P-645.
- 2.04 WELDING MATERIAL: Full penetration, complete fusion thermit type.
- 3.0 EXECUTION



3.01 EXAMINATION

- A. Inspect CWR before loading CWR onto rail train; accept only undamaged CWR. Replace in-kind CWR which becomes damaged and stolen after Contractor has accepted CWR.
- B. Examine ties before laying CWR; ensure that ties are free from ballast and that inserts contain no debris.

3.02 LAYING CWR

- A. Lower CWR onto tract, and with gauge side of CWR facing centerline of track. If CWR will be cut, paint a six- inch stripe on gauge side of each sawn rail. After CWR has been placed, arrange ends of opposite CWR to be more than ten feet from the ends of the placed CWR when measured along centerline of track, and arrange field weld to be more than 10 feet from weld in opposite CWR, more than 14 feet from shop welds in same CWR, and more than 14 feet from center of bonded joints. Align gauge side of CWR in tangent track to be equidistant from track centerline, and align gauge side of low CWR in curved track to be 28-1/4 inches from track centerline; allowable deviations from indicated geometric design shall be as shown in Figure 1.1. Do not strike rail with metal objects. If rail ends will be welded, align rail ends with a rail alignment beam. Record weight, mill-brand, rolling year, and heat number of end rails in CWR; date and time of placing CWR; length of CWR; air and rail temperature; stationing of both ends of CWR; and weather conditions. Place thermometer on shaded side of CWR base next to web and allow thermometer to remain there until no change in temperature is detected, but for not less than five minutes, then read and record temperature and remove thermometer.
  - 1. If CWR will be bolted to abutting CWR, saw-cut end of CWR in which pulling hole has been drilled; sawcut one inch from hole away from end of CWR and perpendicular to CWR, then discard portion containing hole. Cut off bent rail ends of CWR square and clean with either rail saw or abrasive cutting disc. Bevel end of CWR in accordance with AREA Standard Plan Number 1005-40, and drill bolt holes perpendicular to web of CWR using template as drilling guide. If rail is not heat-treated carbon type, harden and chamfer end of CWR by methods and with results specified in AREA MRE, Chapter 4, Part 2, Supplementary Requirement S1.
  - 2. If CWR will be welded to abutting CWR, remove burrs and lipped metal from end of CWR, then remove loose oxide, scale, and foreign material from within six inches of end of CWR.
- B. Gapping CWR
  - 1. At Joints to be welded: Align CWR with abutting CWR, and adjust end of CWR to be thickness-of-field-weld away from abutting CWR.
  - 2. At Joints to be bonded: Calculate gap width by the formula:
$$G = 0.000078L(t-T) + Q$$
where  $G$  = gap, in inches.
$$L$$
 = length of CWR, in feet.
$$t$$
 = 60 degrees F if rail will be anchored in subway;  
75 degrees F if rail will be anchored in Station undercover;  
80 degrees F if rail will be anchored elsewhere.



## 02000 - Site Work

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T = temperature of rail when being anchored.

Q = 0.125 inch if joint will be noninsulated; end post thickness otherwise.

Align CWR with abutting CWR, adjust end of CWR to be width-of- gap away from abutting CWR, and, if gap will be wider than 1- 1/2 inches, insert a dutchman 1/2 inch shorter than width of gap. Remove dutchman before anchoring rail and if it is anticipated that rail will become warmer before being bonded.

3.03 TEMPORARILY ANCHORING CWR: If CWR is either on tangent or on curves the radius of which is larger than 1,900 feet, anchor CWR, by either rail clips or track spikes, at track gauge on every fifth rail fastener or tie plate. CWR on curves with radius of less than 1,900 feet, anchor CWR, by either rail clips or track spikes, at track gauge on every third rail fastener or tie plate. Anchor CWR to tie plates with track spikes and insulators at grade crossing and with rail clips and insulators on concrete ties. Anchor CWR to rail fasteners with bolted rail clips at hi-rail access.

- A. Drive track spikes adjacent to and along both sides of each CWR base with insulator placed between rail and track spike.
- B. Anchor CWR to concrete ties with rail insulators placed on rail base and driving rail clips in tie embedded rail shoulders.
- C. Anchor CWR to rail fasteners at hi-rail access with rail clips inserted in rail fastener, and torque clip bolt to 250 pounds.

3.04 JOINING CWR: Remove rail clips within 300 feet of joint to be welded and of joints to be bonded. Weld ends of CWR indicated to be welded. Bond ends of CWR indicated to be bonded; if a dutchman has been inserted at joints to be bonded, remove dutchman.

- A. Welding
  - 1. Weld in accordance with Specifications for Fabrication of Continuous Welded Rail in Chapter 4, Part 2 of AREA MBE except that running surface shall have a crown ensuring that top of weld is smooth and flat after weld has cooled and excess weld has been ground off. Welding will be acceptable if it satisfies the requirements of Du-Wel Steel Products Co.'s Recommended Procedures for Boutet Process Quick Preheat Thermit Rail Welding.
  - 2. Finish weld by methods and with tools not causing weld to become hotter than 1077 degrees F. Remove surplus metal from hot rail head weld with a mechanical or hydraulic rail- shearing device. Trim and finish welds with a profile grinder. When measured with a three-foot metal straightedge, portions of rail shall be within the following tolerances:
    - a. Top and sides of rail head: Within plus 0.03 inch and minus 0.00 inch of parent rail section.
    - b. Rail base: Within plus 0.01 inch and minus 0.00 inch of the parent rail section, only for welds which are within three inches of edge of rail fasteners and tie plates.
    - c. Rail web and remainder of rail weld: Within plus 0.125 inch and minus 0.00 inch of the parent rail section.
  - 3. Reinstall rail clip on fastener from which removed.



4. Remove oxide, scale, and foreign material from web of rail on both sides of CWR and for three inches on one side of field weld. Paint a two-inch wide stripe one inch from weld the full height of the web on gauge side of CWR and along the base of CWR.
- B. Bonding: TRACK APPURTENANCES.
- 3.05 MEASURING RAIL ALIGNMENT AT SHOP WELDS: Using a steel straightedge and a tapered gauge specified, measure the horizontal and vertical alignment of each string of CWR on both sides of rail head at each shop weld and at points 5/8 inch below top of rail and on top of rail along its centerline. Record measurements at center of welds and at points six inches and 18 inches each way of the weld to the nearest 0.001 inch.
- 3.06 GRINDING AND REMOVING SHOP WELDS: If the Contracting Officer judges that a shop weld in CWR is misaligned, the Contracting Officer will order weld be ground or removed. If the Contracting Officer orders weld be ground, grind weld and adjacent rail to the extent determined by the Contracting Officer, but not more than 1/16 inch thickness. If the Contracting Officer orders weld be removed, saw-cut rails 1/2 inch from each side of weld, field-weld ends of CWR in accordance with Article 3.04A1, and finish welds in accordance with Article 3.04A2 of this Section.
- 3.07 PERMANENTLY ANCHORING CWR: Anchor CWR on aerial structures, in tie- and-ballasted track, in subways, and through station platforms only if temperature of CWR is as specified.
  - A. Mechanically vibrate CWR and loosen rail clips that have been temporarily fastened at every third or fifth tie or rail fastener and in increments of 500 feet. Set CWR to horizontal and vertical alignments within construction tolerances indicated in Exhibit H of this Section.
  - B. Continue vibrating CWR as remainder of rail clips are being permanently installed.
  - C. Record rail-anchoring data, enumerated in penultimate sentence of Article 3.02A, on Exhibit B; include type of adjustment by which zero stress in CWR was achieved and end movement of CWR at 30- minute intervals or at 200-foot lengths of track when rail is being anchored.
  - D. After CWR has been finally surfaced, rail fasteners shall be laterally adjustable not less than 1/4 inch in both directions.
- 3.08 TESTING
  - A. CWR and shop welds: Ultrasonically test CWR and shop welds with a track inspection car. Identify each test with the Project number and title, date, testing agent, and location by station.
  - B. Field welds: Test field welds ultrasonically by the multiprobe pulse-echo technique, and with the Kroutkrame USK-7 tester or accepted equivalent.
- 3.09 ADJUSTING: If shop weld is determined to be defective by ultrasonic testing, remove weld by saw cutting CWR not less than one inch on both sides of the weld, making another cut in CWR not less than 20 feet from weld, and installing new section of rail with two field welds; or cutting out a section of CWR equal distance each way from shop weld.
  - A. If weld and section of CWR is on tangent track, furnish and install a rail not shorter than 14 feet and field-weld that rail to installed CWR.
  - B. If weld and section of CWR is on curved track, furnish and install a rail not shorter than 39 feet and field-weld that rail to installed CWR.



## 02000 - Site Work

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- 3.10      INSTALLING TAGS: Install one foot inside superelevated CWR, and orient tag to be read in ascending order from tangent to spiral to spiral to curve.
- A.      If concrete surfaces of tag locations are rough, grind surfaces smooth. Remove laitance, dust, and clean concrete surface.
- B.      Apply epoxy to back of tags, and tags on track concrete surfaces and on concrete ties at beginning and ending points of curved track and at elevation increments of 1/4 inch within spirals and curves.
- 3.11      GRINDING CWR: Grind top of rail head not fewer than three times and in a continuous operation, all within three days after starting to grind. Remove not less than 95 percent of rust and mill scale.
- 3.12      ADJUSTING TRACK: Eliminate track deviations, as disclosed by the Contracting Officer's analysis of as-built survey data and final track inspection, exceeding specified tolerances.
- 3.13      CLEAN-UP: Remove debris, excess rail, spilled concrete, and clusters of grinding particles. Cut exposed tie wires and stirrups flush with concrete surfaces, remove cuttings.

END OF SECTION 02850f



## SECTION 02850g

### BALLASTED TRACK

- 1.01 DESCRIPTION: This specification covers the furnishing and installation of timber ties, tie plates, rail fasteners, and timber screws for other than special trackwork; loading, transporting, unloading. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.02 REFERENCED DOCUMENTS
- A. Industry Standards
1. American Railway Engineering Association (AREA): Manual for Railway Engineering (MRE): Chapter 3, Ties and Wood Preservation  
Part 1 Timber Cross Ties  
Part 7 Specification for Preservatives  
Part 9 Specification for Treatment
  2. American Society for Testing and Materials (ASTM): D789, Nylon Injection Molding and Extrusion Materials.
- 1.03 DEFINITIONS: Surfacing track: Raising and aligning track.
- 1.04 QUALITY CONTROL
- A. Source quality control: If ballast appearance changes, visually inspect production site immediately before shipping first batch of ballast having that changed appearance.
- B. Construction equipment: Subject to inspection and acceptance by the Contracting Officer.
1. Ballast roller: Self-propelled, pneumatic-tired, and not lighter than nine tons.
  2. Ballast compactor: Vibratory, be not lighter than 2-1/2 tons, and be capable of applying a dynamic load of nine tons. Ensure that control of compactor's tamping cycle will induce maximum uniform compaction.
  3. Ballast tamper: Production type having not fewer than 16 squeeze-type vibrating tamping heads, and have construction buggy and automatic liner.
  4. Ballast equalizer: Have rubber broom brushes; Tamper (Divn. Camron Corp.) Model BEB-17, or accepted equivalent.
  5. Vibrator/compactor for shoulder and crib: Acceptable to the Contracting Officer.
- 2.0 PRODUCTS





## 02000 - Site Work

- 2.01 BALLAST: Crushed granite or granite gneiss satisfying AREA specification for size No. 4, except percentage of wear of processed ballast, tested in the Los Angeles machine, shall be not more than 45 percent.
- 2.02 TIMBER TIES: New; preserved; either oak, Lophira Alota, or Lophira Procera; and conform to AREA MRE Chapter 3, Part 1. Ties shall be seven inches thick by nine inches wide, plus one inch, minus 1/4 inch, both between points 12 inches from each end of tie. Ties shall be Boulton-treated or air-dried to an oven dry moisture content of not more than 50 percent before being preserved, unless ties are released for treatment by the Contracting Officer before ties have attained specified moisture content.
- A. Anti-splitting device: 18 gauge, six-inch by eight-inch; either Portec Inc.'s, Railway Products Division Gang-Nail Protection End Plate or fluted spiral-threaded steel dowel 1/2 inch diameter by 7-3/4 inches long.
- B. Preservative: 60/40 creosote-coal tar solution (Grade C) conforming to AREA MRE Chapter 3, Part 7.
- C. Fabrication
1. Saw top, bottom, sides, and ends of ties.
  2. Incising: AREA MRE Chapter 3, Part 9.
  3. Anti-splitting device: Applied before tie is seasoned.
    - a. If device will be a plate, install plate at each end of each tie.
    - b. If device will be a dowel, install two dowels between four and six inches from each end of each tie, one dowel two inches from top surface, and one dowel two inches from bottom surface.
- D. Preserving: Preserve fabricated ties by the empty-cell process in accordance with AREA MRE Chapter 3, Part 9.
1. Preserve fabricated tie only after tie has been inspected and released for treatment by the Contracting Officer, only after preservatives have been tested by an accepted independent testing laboratory, and in the presence of the Contracting Officer if the Contracting Officer so elects.
  2. Preserve fabricated ties either to refusal or until ties retain not less than eight pounds of solution per cubic foot.
  3. Record treatment as specified in AREA Records of Treatment and Reports of Inspection.
  4. Ties will be inspected by the Contracting Officer before ties are loaded for shipment. Tie will either be released for shipment or rejected at that time.
- 2.03 RAIL FASTENER AND ANCHORAGE ASSEMBLY
- A. Rail fastener: L. B. Foster Co.'s Transit Div.'s Type H-10, or accepted equivalent.
- B. Anchorage assembly: Timber screws; steel, 7-1/2 inches long with 0.875 inch diameter shoulder and square head; Camcar Div. of Textron Industries, Inc.'s 3/4-4 Interior Torx Truss Square Head, or accepted equivalent.
- 2.04 TIE PLATE AND ANCHORAGE ASSEMBLY



- A. Tie plate: Seven-inch wide by 14-inch, rubber-impregnated fiber, double-shoulder type; The Johnson Rubber Co., or accepted equivalent.
- B. Track spike: Arthur Railroad Spikelock Corp.'s Spikelock, or accepted equivalent.
- C. Track spike insulator: Nylon conforming to ASTM D789, Type 1, Grade 2, and resistant to ultraviolet rays.

3.0 EXECUTION

3.01 EXAMINATION

- A. Examine exposed conduit, conduit stub-ups, and drainage fittings for conformance to vertical and horizontal positioning and interface with surface mounted electrical appurtenances.
- B. Examine alignment and elevation of existing work for interface with work of this Section. Use bench marks and horizontal control points established by Contracting Officer. Report adjustments at interfaces with existing work, to produce alignment and elevations indicated for work of this Section, to Contracting Officer for resolution before work of this Section is started.

3.02 PREPARATION: Stake out centerlines of track and curvature points. Set top of rail elevation markers at 31-foot intervals along centerline of track.

3.03 INSTALLATION

- A. Uniformly distribute a 1-1/2-inch layer of ballast on approach slabs and on ballasted deck aerial structures. Roll ballast to the extent that ballast will be seated in asphaltic concrete approximately 1/2 inch.
- B. Initial ballast
  - 1. Uniformly distribute ballast to the extent that thickness of each layer of compacted ballast will be four inches. Arrange top of initial layer of ballast to be not less than four inches below surface of final ballast.
  - 2. Uniformly spread each lift of ballast with not less than four passes of either a roller or compactor.
- C. Concrete ties: Place ties on 30-inch centers in primary track and at crosswalks, on 33-inch centers in secondary and yard tracks, and on 20-inch centers at insulated joints.
  - 1. Place ties in a manner which will ensure that bottom of each tie will bear fully on initial layer of ballast and be normal to track centerline.
  - 2. Arrange ends of concrete ties containing contact rail bracket anchor inserts to be on contact rail side and ends of ties on line side of track to be equidistant from rail.
  - 3. Place tie pads on concrete tie between rail shoulders.
- D. Timber ties: Place ties on 18-inch centers at hi-rail access and on 19-3/16-inch centers at grade crossing.
  - 1. Place ties normal to centerline of track, with wider heartwood facing downward, and with ends on line side of track equidistant from centerline of track.



## 02000 - Site Work

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2. Place tie plate square with CWR and centered on timber ties to final rail line and gauge within limits of grade crossing. Place rail fasteners square with CWR and centered on timber ties to final rail line and gauge within limits of hi-rail access.
3. Drill 1/4 inch diameter holes through installed timber ties for track spikes and timber screws, and coat surfaces of drilled holes with pentachlorophenol. Anchor rail fasteners and tie plates with timber screws to ties. Tighten timber screws to torque specified by screw manufacturer.

3.04 SURFACING: Place ballast in cribs and at shoulders of track, and in quantities which will fill tie cribs, be sufficient for initial track raise, and hold track after initial track raise.

- A. Surface track by methods which will neither bend rail, strain joints, nor damage rail fastenings. Tamp ballast on both sides of tie simultaneously, from points 15 inches inside both rail centers to ends of tie. Limit each track lift to not more than four inches. Initially raise track to an elevation which will ensure that a final raise of neither less than one inch nor more than three inches will bring track to final surface.
- B. Remove ties and fastenings made unserviceable, in the opinion of the Contracting Officer, during surfacing operation and install new ties and clips.
- C. Dress ballast to the extent that ballast between ties will be level and one inch below base of rail, and that ballast at shoulder will be compacted and sloped as indicated.
- D. Place plugs in holes in which contact rail assembly inserts have not been placed.

END OF SECTION 02850g



## SECTION 02850h

### DIRECT-FIXATION TRACK

- 1.01 DESCRIPTION: This specification covers the furnishing and installation of direct-fixation track. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.02 REFERENCED DOCUMENTS
- A. Industry Standards
    - 1. American Society for Testing and Materials (ASTM)
      - A167 Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip
      - C191 Time of Setting of Hydraulic Cement by Vicat Needle
    - 2. U. S. Army Corps of Engineer: CRD-C621, Nonshrink Grout
- 1.03 QUALITY CONTROL
- A. Construct a complete section of direct-fixation track not shorter than 250 track feet; construct within trackway and where required by the Contracting Officer. Section constructed as indicated will become a part of the permanent track; otherwise, remove section and construct another section until section is constructed as indicated.
  - B. If inserts will be installed in a hole cored into the track concrete, furnish services of grout manufacturer's representative for one working day at start of coring operations. Representative shall inspect cored hole; if hole is acceptable to representative, representative shall enforce grout manufacturer's mixing and installation procedures and methods and witness the placing of grout and inserts.
- 2.0 PRODUCTS
- 2.01 GROUT: Premeasured, prepackaged, cement-based, nonmetallic, nonshrink type; CRD C621. Retemper only in accordance with manufacturer's printed instructions. Water shall be potable.
- A. Shrinkage
    - 1. Grout for repairing voids in track concrete: Zero percent shrinkage in plastic state and not more than 0.1 percent expansion in hardened state when tested in accordance with CRD-C621, Sections 10.1 and 10.2.
    - 2. Grout for setting anchorage inserts: Zero percent shrinkage and expansion in plastic and hardened states when tested in accordance with CRD C621, Sections 10.1 and 10.2.
  - B. Compressive strength, when tested in accordance with CRD C621:
    - 1. Grout for repairing voids in track concrete: 5,000 psi at end of 28 days.



## 02000 - Site Work

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2. Grout for setting anchorage inserts: 2,000 psi at end of seven days.
- C. Initial setting time, when tested in accordance with ASTM C191:
  1. Grout for repairing voids in track concrete: Not sooner than 60 minutes.
  2. Grout for setting anchorage inserts: Not sooner than 10 minutes.
- 2.02 SHIMS: ASTM A167, UNS S30400; and 1/16-, 1/8- and 1/4-inch thick. Shim for rail fastener not having full bottom plate shall be 1/4 inch larger on all sides than rail fastener under which it will be placed. Holes shall be one inch diameter, and either punched or drilled to anchor bolt pattern.
- 2.03 THREAD SEALANT: Low melting point wax; Sanchem, Inc.'s NO-OX-ID 'A' Special, or accepted equivalent.
- 3.0 EXECUTION
- 3.01 PREPARATION: Test the Contracting Officer-selected anchorage inserts.
  - A. Pull-out test
    1. Test equipment
      - a. Reaction plate: Steel plate with a hole drilled in center that is one inch larger than the insert top collar.
      - b. Loading system: As shown on accepted working drawings.
    2. Test Procedures
      - a. Restrained test: Place reaction plate over anchorage insert to be tested. Set-up accepted loading system and connect that system to bolt engaged in anchorage insert. Exert initial uplift of 1,000 pounds against reaction plate. Increase load against reaction plate at rate of 1,000 pounds per second until load becomes 20,000 pounds.
      - b. Unrestrained test: Remove reaction plate and apply load of 10,000 pounds uplift on anchorage insert against reaction surface outside six-inch diameter area in which anchorage insert is centered.
    3. Acceptance criteria: No evidence of anchorage moving upward.
    4. Remedies: Anchorage insert failing to satisfy acceptance criteria will be rejected.
      - a. Test every insert along that rail in both directions until 10 successive inserts in each direction satisfy the acceptance criteria.
      - b. Remove defective anchorage insert and furnish and install new insert. Test new insert, and prepare a pullout test inspection report after that insert has been tested.
  - B. Torque test
    1. Procedure: Screw anchor bolt into anchorage insert tight against lock nut set two inches from end of bolt. Apply 500 foot-pounds to anchor bolt head.
    2. Acceptance criteria: Anchorage insert shall show no evidence of rotational movement.



3. Remedies: Anchorage insert failing to satisfy acceptance criteria or not installed within the tolerances specified or both, will be rejected. Should an insert fail the torque test, test inserts in accordance with Article 3.01A1a.

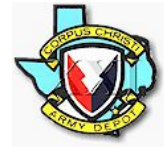
3.02 EXAMINATION: Verify that the following conditions exist, and record data on Exhibits A, B, and C of this Section and of other Sections:

- A. Bearing surface of track concrete is within allowable tolerances for cant, elevation, and dimensions.
- B. Rail fastener anchorage inserts are undamaged, and have been installed perpendicular to and flush with top of concrete.
- C. Anchorage inserts have been subjected to restrained and unrestrained pull-out tests and torque tests, and defective inserts have been removed and replaced.

3.03 INSTALLATION

- A. Remove plugs from anchorage inserts and place rail fasteners with anchor bolts engaged in inserts. Coat threads of anchor bolts with thread sealant.
- B. Install shims between rail fastener and track concrete. Install not more than two shims at each rail fastener.
- C. Fully anchor rail fasteners to track concrete with anchor bolts torqued to 300 foot-pounds. Tighten anchor bolts on both sides of rail simultaneously. Check torquing equipment daily; torque of equipment shall be within two foot-pounds of that of calibrated and certified torque wrench specified in CONTINUOUS WELDED RAIL.

END OF SECTION 02850h



## SECTION 02850i

### TRACK APPURTENANCES

#### PART 1 - GENERAL

- 1.01 DESCRIPTION: This specification covers the furnishing and installation of buffers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.02 REFERENCED DOCUMENTS
- A. Industry Standards
1. American Railway Engineering Association (AREA): Manual of Railway Engineering (MRE): Chapter 4, Part 1
  2. American Society for Testing and Materials (ASTM):  
A36 Structural Steel  
A325 High-Strength Bolts for Structural Steel Joint
  3. American Welding Society (AWS): D1.1, Structural Welding Code
  4. National Electrical Manufacturers Association (NEMA): LI-1 Industrial Laminated Thermosetting Products
- 1.03 QUALITY CONTROL
- A. Field quality control
1. Before installing insulated joints, have each joint installing crew prepare two samples of that joint.
  2. Have an independent testing laboratory test each insulated joint sample for resistance to longitudinal pull-apart.
  3. Record and certify that rail has been re-anchored within the zero stress temperature range.
- B. Testing: In lieu of qualification testing of insulated joints, Contractor may submit certification by an independent testing laboratory that insulated joints have passed either the tests specified in this Article or equivalent tests. Test two samples for resistance to longitudinal pull apart, and test one sample for electrical resistance.
1. Longitudinal pull apart test
    - a. Preparation
      - (1) Assemble bonded insulated joint complete, on two pieces of 115-pound RE rail each two feet long.



- (2) Saw joint assembly in half where rails are butted together and at right angles to centroid of rail.
    - (3) Ensure that sawing does not overheat and damage prebonding adhesive.
    - (4) Affix a device which will confine the reaction at the sawn end to the face of the joint bar when a load is applied at the centroid of the rail at the opposite end.
  - b. Testing
    - (1) Apply test longitudinally in increments of 25,000 pounds maintaining each increment until longitudinal deflection of rail ceases before increasing load to next increment.
    - (2) Increase load in increments until a total load of 650,000 pounds is attained or failure occurs.
    - (3) At each increment of loading, measure and record load, and differential movement of rail and joint bars, to nearest 0.001 inch.
  - c. Acceptance criteria
    - (1) Stability: No indication of slippage of rail joint before total test load reaches 650,000 pounds.
    - (2) Differential movement in all directions: not more than 1/8 inch.
    - (3) Difference between original position of joint bar and rail and final position thereof after final test load has been released: not more than 1/32 inch.
    - (4) Basis of rejection: Failure of joint to satisfy above requirements.
2. Stroke rolling loading test
  - a. Preparation: Mount bonded joint on a 33-inch stroke rolling load test machine and support on 36-inch centers; center joint as indicated in Exhibit A of this Section.
  - b. Testing: Apply 44,400 pound load on rail for 2,000,000 cycles. Measure and record deflection at rail centerline to nearest 0.001 inch when wheel load is over points A and B for every 500,000 cycles.
  - c. Develop moment diagram.
  - d. Acceptance criteria
    - (1) Moment diagram envelope generated by methods other than those specified and submitted in accordance with Article 1.04B of this Section. Satisfy diagram shown in Exhibit B of this Section.
    - (2) After 2,000,000 cycles: Exhibit no evidence of failure by bending of bonded insulated joint.
    - (3) Deflection exhibited by bonded insulated joint: Not further than 0.065 inch.
3. Electrical resistance test: If specimen satisfies mechanical acceptance criteria of preceding tests, test specimen for electrical resistance; record results on Exhibit C of this Section.





## 02000 - Site Work

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- a. Preparation: Assemble bonded insulated joint complete, in accordance with manufacturer's instructions, on two pieces of 115 pound RE rail, one rail 24 inches long, the other 42 inches long. Support both rails on electrically nonconductive material.
- b. Testing
  - (1) Apply 500 volts DC to rail across bonded insulated joint for three minutes. During that time, measure and record, to nearest 0.1 ampere, current flow through joint.
  - (2) Apply 50 volts AC to rail across joint for three minutes for each increment of measurement at frequencies of 20 hertz to 10 kilohertz in increments of 20 hertz to 100 hertz, 200 hertz to 1,000 hertz, and two kilohertz to 10 kilohertz. After three minutes, measure and record impedance within accuracy of plus or minus two percent.
- c. Acceptance criteria
  - (1) Resistance for 500 volts DC: Not less than 10 megohms.
  - (2) Impedance for all frequencies between 20 hertz and 10 kilohertz with 50 volts AC not less than 10 megohms.

### 2.0 PRODUCTS

#### 2.01 INSULATED JOINT

- A. Joint bar: 36 inches long; quenched and tempered carbon steel; fabricated in accordance with AREA MRE Chapter 4, Part 1, Table 1, for 115-pound RE rail; have six, 1-1/4-inch diameter holes spaced in accordance with AREA MRE Chapter 4, Part 1, Table 1; have a length tolerance of 1/8 inch; have a straightness tolerance of 1/32 inch on 36 inches along contact surface; and have no marking on contact surface. Modify bar for rail restrained by direct-fixation fasteners.
- B. Adhesive: Allegheny Drop Forge Co.'s "Temprange" or accepted equivalent.
- C. Mesh: Fiberglass; Allegheny Drop Forge Co.
- D. Pin bolts and insulation for bonded insulated joint
  - 1. Bolt: 9-1/8-inch by 1-1/8-inch diameter pin-type; ASTM A325; Huck Corp's C50LR-BR-36-68.
  - 2. Washer: ASTM A325, flat, 2-1/4 inches O.D. by 1-3/16 inches I.D. by 1/8 inch thick.
  - 3. Collar: 1-1/8-inch diameter; ASTM A325; Huck Corp.'s LC- 2R36.
  - 4. Bushing: Fiberglass conforming to NEMA LI-1, Grade G10.
  - 5. Post: High-pressure laminate conforming to NEMA LI-1, Grade CE.
- E. Pin-bolts for unbonded insulated joints
  - 1. Bolt: ASTM A490, 1-1/8-inch diameter, hex head type, six inches long.
  - 2. Washer: ASTM A325, spring steel, 1/8 inch thick, 2-1/4-inch O.D.
  - 3. Nut: ASTM A490, hex head locknut.



- 2.02 BUFFER: Friction type having head modified for MARTA anti-climber; Godwin Warren Engineering Inc.'s Type 12/4, or accepted equivalent.
- A. Type A: Capable of controlling the stopping of an eight-car train under the following conditions:
    - 1. Impact force: Not more than 130,000 pounds;
    - 2. Impact speed: 15 mph;
    - 3. Weight per car: 81,000 pounds;
    - 4. Rotational inertial weight per car: 7,800 pounds; and
    - 5. 98 feet of track available for buffer installation.
  - B. Type B: Capable of controlling the stopping of a two-car train in the yard when that train, decelerating at a rate of not more than 0.3 g's, strikes the buffer at 15 mph; and capable of controlling the stopping of a four-car train under the following conditions:
    - 1. Impact force: Not more than 130,000 pounds;
    - 2. Impact speed: 15 mph;
    - 3. Weight per car: 81,000 pounds;
    - 4. Rotational inertial weight per car: 7,800 pounds; and
    - 5. 38 feet of track available for buffer installation.
  - C. Paint for structural steel surfaces not facing transit vehicle
    - 1. Primer: Either Pratt and Lambert Co.'s Rust-Inhibiting Effecto Enamel, PPG Corp.'s No. 6-208, Porter Paint Co.'s No. 297, Sherwin-Williams Co.'s Kem Kromik, or Tnemec Co.'s No. 10-99.
    - 2. Enamel: Color international orange; either Pratt and Lambert Co.'s Effecto Enamel, PPG Corp.'s No. 6-252, Porter Paint Co.'s No. 400, Sherwin-Williams Co.'s Industrial Enamel B54 Series, or Tnemec Co.'s Series 2H.
  - D. Paint for structural steel surfaces facing transit vehicle: Reflective type; Ferro Corp., Cataphote Division's Alert- Reflective Yellow, 3M Co.'s Scotchlite Brand Reflective Liquid, or accepted equivalent.
- 2.03 BUMPER: Capable of controlling the stopping of a two-car train under the following conditions.
- A. Impact force: Not more than 150,000 pounds.
  - B. Impact speed: 10 mph
  - C. Weight per car: 81,000 pounds.
  - D. Rotational inertial weight per car: 7,800 pounds.
  - E. Striking block
    - 1. Adapter plate: Mild steel.
    - 2. Rubber block: 70 to 80 shore hardness, and adhered to adapter plate.



## 02000 - Site Work

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- F. Shock absorber: Hydraulic type having 31-1/2-inch stroke; Gantrex Corp.'s Type 15 Oleo, or accepted equivalent.
- G. Post
  - 1. Structural steel plates, shapes, and bars: Carbon steel; ASTM A36.
  - 2. Welding electrodes: AWS D1.1; E70XX.
  - 3. Anchor bolts: 5/8 inch and 3/4 inch diameter; ASTM A325.
  - 4. Concrete forms: CONCRETE FORMWORK
  - 5. Concrete: PORTLAND CEMENT CONCRETE.
  - 6. Reinforcing bars: CONCRETE REINFORCEMENT.
- H. Paint
  - 1. Primer: Either Pratt and Lambert Co.'s Rust-Inhibiting Effecto Enamel, PPG Corp.'s No. 6-208, Porter Paint Co.'s No. 297, Sherwin-Williams Co.'s Kem Kromik, or Tnemec Co.'s No. 10-99.
  - 2. Enamel: Color international orange; either Pratt and Lambert Co.'s Effecto Enamel, PPG Corp.'s No. 6-252, Porter Paint Co.'s No. 400, Sherwin-Williams Co.'s Industrial Enamel B54 Series, or Tnemec Co.'s Series 2H.

2.04 RAIL LUBRICATOR: Moore and Steele Corp.'s Model No. DR-4 (561), or accepted equivalent.

2.05 CAR STOP: L. B. Foster Co.'s Figure X, or accepted equivalent.

### 3.0 EXECUTION

#### 3.01 INSULATED JOINTS

- A. Preparation: If rail brand exists where joint bar will touch CWR, remove rail brand. Calibrate bolt-tightening and -swaging tool by testing three typical bolts in a device capable of indicating actual bolt tension.
- B. Installation
  - 1. Drilling: Position holes in accordance with AREA MRE Chapter 4, Part 1, Table 1. Drill 1-3/8-inch diameter holes; use template as a drilling guide.
  - 2. Install joint bar, adhesive, fasteners, and insulating materials in accordance with manufacturer's printed recommendations except install no adhesive at joints at Stations .
    - a. Bonded insulated joint: Drive pin bolts with tool capable of swaging collars to the extent that bolts may be adjusted. Set tool to produce not less than 56,000 pounds tension in pin bolts, to swage collars into annular locking grooves, to form collar, and to ensure that bolts will conform to grip range limits recommended by bolt manufacturer.
    - b. Unbonded insulated joint: Tighten each track bolt to 25,000 pounds, starting from middle of joint and working to the ends.
  - 3. Ensure that joint products and rail fasteners do not touch each other.



4. Center insulated joints not less than five inches from edge of tie and rail fastener.
  5. Attach grounding cable, to base of each CWR, immediately adjacent to joint at Stations .
  6. Tolerances from design dimensions.
    - a. Bonded insulated joint bar
      - (1) Finishing height: 1/64 inch.
      - (2) Length: 1/8 inch.
      - (3) Straightness, as determined by use of a 36-inch straightedge: 1/32 inch.
    - b. Bonded insulated joint end post
      - (1) Thickness: Plus 1/16 inch, minus zero inch.
      - (2) Projection below base of rail: 1/16 inch
  - C. Joint bolt hole: AREA MRE, Chapter 4.
  7. Testing: Measure continuity across joint.
  - D. Remove clamps, flexible ground cables, fasteners, and joint bars from joints at Stations ; deliver those products to Contracting Officer's Yard.
- 3.02 BUFFERS: Install buffers in accordance with manufacturer's printed instructions, and with four sets of trailing shoes set at a torque of 100-foot pounds, except that friction buffer at Station shall be installed with two sets of trailing shoes set at a torque of 150-foot pounds. Installed buffers shall be inspected by manufacturer's representative and, if approved by that representative, commissioned by that representative.
- A. Dismantle buffer at Stations , and temporarily install buffer at Station .
  - B. Install new buffers at Stations .
  - C. Install friction buffer at Station .
  - D. Cleaning and painting
    1. Clean surfaces to be painted; wash surfaces with mineral spirits, and dry. Open drain holes in structural framework. Wire brush or blast unpainted ferrous surfaces to white metal.
    2. Apply paint with clean and operable equipment and tools as soon as practicable after surfaces have been prepared; wet film shall cure to specified dry film thickness.
- 3.03 BUMPER
- A. Weld in accordance with AWS D1.1.
  - B. Form concrete in accordance with CONCRETE FORMWORK. Place concrete reinforcement and concrete in accordance with CONCRETE REINFORCEMENT, and CAST-IN-PLACE CONCRETE, respectively. Finish exposed concrete in accordance with UNFORMED-CONCRETE FINISHES.
  - C. Cleaning and painting: Clean and paint posts and framework as specified.



## 02000 - Site Work

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- 3.04 RAIL LUBRICATOR: Install lubricator in accordance with manufacturer's printed instructions.
- 3.05 CAR STOPS: Install stops in accordance with stop manufacturer's printed installation instructions. Install one stop three feet from end of shorter rail behind each buffer, and install one stop directly opposite that stop.

END OF SECTION 02850i



## SECTION 02850j

### CONTACT RAIL SYSTEM

- 1.01 DESCRIPTION: This specification covers the furnishing and installation of contact rail. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.02 REFERENCED DOCUMENTS
- A. Industry Standards
1. American National Standards Institute (ANSI)
    - C68.1 Dielectric Tests (ANSI/IEEE 4)
    - C80.1 Rigid Steel Conduit - Zinc Coated
    - Z1.8 General Requirements for a Quality Program
  2. American Society for Testing and Materials (ASTM)
    - A47 Malleable Iron Castings
    - A153 Zinc Coating (Hot-Dip) on Iron or Steel Hardware
    - A165 Electrodeposited Coatings of Cadmium on Steel
    - A307 Carbon Steel Externally Threaded Standard Fasteners
    - A325 High Strength Bolts for Structural Steel Joints, Including Suitable Nuts and Plain Hardened Washers
    - A588 High Strength Low Alloy Structural Steel with 50,000 psi Minimum Yield Point to Four Inches Thick
    - B3 Soft or Annealed Copper Wire
    - B8 Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
    - B33 Tinned Soft or Annealed Copper Wire for Electrical Purposes
    - B98 Copper-Silicon Alloy Rod, Bar or Shapes
    - B134 Brass Wire
    - B173 Rope-Lay-Stranded Copper Conductors having Concentric- Stranded Members, for Electrical Conductors
    - B189 Lead-Coated and Lead-Alloy-Coated Soft Copper Wire for Electrical Purposes
    - D149 Dielectric Breakdown Voltage and Dielectric Strength of Electrical Insulating Materials at Commercial Power Frequencies
    - D256 Impact Resistance of Plastics and Electrical Insulating Materials



## 02000 - Site Work

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- D570 Water Absorption of Plastics
- D638 Tensile Properties of Plastics
- D2000 Rubber Products in Automotive Application
- D2240 Rubber Property-Durometer Hardness
- D2802 Ozone-Resistant Ethylene-Propylene Rubber Insulation for Wire and Cable
- E8 Tension Testing of Metallic Materials
- 3. Institute of Electrical and Electronics Engineers (IEEE): 383, Type Test of Class IE Electric Cables, Field Splices, and Connection for Nuclear Power Generating Stations
- 4. Insulated Cable Engineers Association (ICEA)
  - S-66-524 Cross-Linked Thermosetting Polyethylene- Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy
  - S-68-516 Ethylene-Propylene-Rubber-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy
  - S-19-81 Rubber-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy
- 5. National Electrical Manufacturers Association (NEMA)
  - TC-14A Filament-Wound Reinforced Thermosetting Resin Conduit and Fittings
  - WC3 Rubber-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy
  - WC7 Cross-Linked Thermosetting Polyethylene-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy
  - WC8 Ethylene-Propylene-Rubber-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy
- 6. Underwriters' Laboratories, Inc. (UL)
  - UL6 Rigid Metal Electrical Conduit
  - UL44 Rubber Insulated Wires and Cables - VW-1, Flame Test
  - UL651 Schedule 40 and 80 Rigid PVC Conduit

### 1.03 QUALITY CONTROL

- A. Ensure that manufacturers of products specified in Part 2 of this Section maintain a quality program conforming to ANSI Z1.8.
- B. Qualification tests: Certified tested off-the-shelf anchor insulator rod may be submitted to satisfy test requirements. Test three samples of prototype rods, rod material, and assemblies. If tested anchor insulator rods, rod material, and assemblies fail to satisfy test requirements, redesign those products to the extent that cause of failure will be eliminated.
  - 1. Dielectric strength test on rod
    - a. Test procedure: ASTM D149.



- b. Dielectric strength: Samples shall exhibit a dielectric strength of not less than 150 volts per mil applied to material surface without breakdown.
  2. Izod impact strength test on rod
    - a. Test procedure: ASTM D256, Method A; each sample shall measure 1/4 inch wide and conform to Figure 4.
    - b. Average impact strength: Not less than eight foot-pounds per inch of notch.
  3. Water absorption test on insulator rod
    - a. Test procedure: ASTM D570. Each sample shall be two inches in diameter by 1/8 inch thick.
    - b. Gain in weight after test sample has been immersed in water for 24 hours: Not more than 0.50 percent of its original weight.
  4. Resistance test on insulator rods (without clevises)
    - a. Test instrument: 2500-volt megohmmeter.
    - b. Preparation of test sample: Affix wet clay pad to each end of rod.
    - c. Procedure
      - (1) Apply megohmmeter probes across each end of rod. Measure resistance. Reject test sample for which resistance values are less than infinity.
      - (2) Immerse test sample in water for 72 hours, remove from water, and dry sample with clean absorbent cloth.
      - (3) Apply megohmmeter probes across each end of rod. Measure resistance.
      - (4) Reject test sample for which resistance values are less than ten megohms.
  5. Tensile strength test on insulator rods and clevises
    - a. Procedure: ASTM D638.
    - b. Tensile strength within temperature range of zero degrees to 100 degrees F: not less than 15,000 pounds.
    - c. Make and maintain records of rate at which failure occurs and descriptions of nature of failure.
  6. Dry flashover (60 hertz) test on same three insulator rods and clevises tested for tensile strength
    - a. Test Procedure: ANSI C68.1.
    - b. Voltage without flashover: Not less than 200,000 volts.
  7. Test jumper cable, flexible cable, and expansion joint shunt cable.
    - a. Cables shall have each insulated length of conductor, after extrusion and before further processing, immersed in a water tank for not fewer than 24 hours. Apply AC voltage withstand test at the end of 24 hours for five minutes on each length of insulated conductor. Applied AC test voltage shall be 11.5 kV for 750 MCM cable, and 9.5 kV for 350 MCM and 500 MCM cable.





## 02000 - Site Work

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- b. Verify that insulation and jacket wall thickness comply with these specifications.
    - c. Cable shall have DC resistance of each conductor of each length of completed cable measured and recorded.
  - 8. Test tensile strength of specimens milled from welded contact rail.
    - a. Test five specimens of contact rail weld in accordance with ASTM E8.
    - b. Tensile strength: Not less than 39,000 psi.
    - c. Nominal diameter of test specimen: 1/2 inch.
- C. Identification
  - 1. Part numbers
    - a. Excepting fastening hardware and industry or government standard products, ensure that manufactured products are permanently marked with name, symbol, or other identification.
    - b. Ensure that similar-appearing parts, not physically or functionally the same, are permanently marked with part number, and part number is visible after installation.
    - c. Ensure that superseding parts are marked in the same manner as the parts they supersede.
    - d. Ensure that parts marked with the same part number have the same functional and physical characteristics, are equivalent in performance and durability, and are interchangeable with alteration to neither themselves nor to associated products.
    - e. Ensure that parts are not marked for identification by color, color dots, and serial or modification numbers, but that, instead marking parts to differentiate between old and new configurations is accomplished by part number change and controlled by a new drawing or dash number added to the original drawing.
  - 2. Lot number
    - a. Instruct part manufacturers to develop a lot numbering system providing permanent lot identification marking of parts and complete traceability to manufacturer's lot records.
    - b. Ensure that a copy of lot records is attached to each shipment of products.
- D. Inspect products before loading those products. Accept no visually defective product.

### 2.0 PRODUCTS

#### 2.01 COMPONENTS FOR INSTALLING INSULATOR

- A. Fasteners for securing insulators to concrete pedestal:
  - 1. Cap screws: 5/8 inch diameter, ASTM A307, Grade A, cadmium-plated in accordance with ASTM A165, UNC type. Length of shank and thread shall ensure thread engagement of two inches, plus or minus 1/2 inch.
  - 2. Lock and flat washer: Same material and finish as cap screws; size to fit cap screws.



3. Insert: Externally corrugated 5/8 inch diameter steel ferrule welded along its exterior quarter lines to four hardened AWG No. 4 steel wires bent outward at right angles to long axis of ferrule. Ferrule and vertical and horizontal legs of wire shall be three inches long. Galvanize insert in accordance with ASTM A153.
- B. Fasteners for securing insulator to concrete tie insulator mounting bracket
  1. Bolt: 5/8 inch diameter ASTM A307, Grade A, cadmium-plated in accordance with ASTM A165, UNC Type.
  2. Locknuts and washers: Same material and finish as bolts; size to fit bolts.
- C. Fasteners for securing insulator to timber ties
  1. Screws: 5/8 inch diameter steel lag type either galvanized in accordance with ASTM A153 or cadmium-plated in accordance with ASTM A165.
  2. Lock and flat washers: ASTM A307, Grade A, cadmium-plated in accordance with ASTM A165; size to fit screw.
- D. Shims: 6-1/4 inches by 9-1/4 inches, and have 1/8 inch radius corners and 11/16 inch diameter by 7/8 inch long slotted holes positioned to match four holes in insulator base.
  1. For adjusting insulator elevation
    - a. Material: Steel, galvanized after fabrication in accordance with ASTM A153.
    - b. Thickness: Equal amount of 1/8 inch, 1/4 inch, and 3/8 inch.
  2. For cushioning insulators
    - a. Material: Neoprene, ASTM D2000, Specification 1BC415.
    - b. Durometer hardness: Between 40A and 50A.
    - c. Thickness: Not thicker than 1/8 inch.

## 2.02 ANCHOR ASSEMBLIES

- A. Rod insulation: Applied as a coating or affixed to surface with sealant consisting of 1-1/2 mils of DuPont Tedlar or two mils of polyurethane containing an ultraviolet ray inhibitor accompanied by manufacturer's instructions for periodic coating of insulator rod.
- B. Clevises: Malleable iron, ASTM A47 galvanized ASTM A153, bolts and locknuts ASTM A307, Grade A, UNC type, with washers to suit, cadmium-plated ASTM A165. In lieu of bolt with nut connection, use a galvanized rivet, ASTM A325, Grade A with cotter pin, ASTM B134.
- C. Tie-down bracket: ASTM A36 steel, galvanized in accordance with ASTM A153.
- D. Fasteners for securing anchor tie-down brackets to concrete pedestal: Cap screws, lock washers, and inserts; cap screws: 3/4 inch diameter, ASTM A307, Grade A, cadmium-plated in accordance with ASTM A165, UNC type. Length of shank and thread shall ensure thread engagement of two inches, plus or minus 1/2 inch. Lock and flat washer: Same material and finish as cap screws; size to fit cap screws. Insert: Externally corrugated 5/8 inch diameter steel ferrule welded along its exterior quarter lines to four hardened AWG No. 4 steel wires bent outward at right angles to long axis of ferrule. Ferrule and vertical and horizontal legs of wire shall be three inches long. Galvanize insert in accordance with ASTM A153.



## 02000 - Site Work

- E. Fasteners for securing anchor tie-down bracket to concrete and wood tie: Cap and lag screw. Cap screws for affixing bracket to concrete tie and structure: 3/4 inch diameter, conform to ASTM A307, Grade A, cadmium-plated in accordance with ASTM A165, UNC type.
- F. Clamps for securing anchors to contact rail: 3/4 inch diameter eye bolt type, steel conforming to ASTM A325, Type 1, UNC, cadmium-plated in accordance with ASTM A165, and have compatible lock nuts and washers.
- G. Insert for securing support bracket: Insert: Externally corrugated 3/4 inch diameter steel ferrule welded along its exterior quarter lines to four hardened AWG No. 4 steel wires bent outward at right angles to long axis of ferrule. Ferrule and vertical and horizontal legs of wire shall be three inches long. Galvanize insert in accordance with ASTM A153.

2.03 CONCRETE FORMWORK: CONCRETE FORMWORK.

2.04 CONCRETE REINFORCEMENT: CONCRETE REINFORCEMENT.

2.05 CONCRETE: Class 3000 PORTLAND CEMENT CONCRETE.

2.06 SPLICE BARS FOR END APPROACH ASSEMBLIES

- A. Bar: Steel having an ultimate tensile strength of not less than 36,000 psi. Bend to angle, and drill to accommodate slope angle.

- B. Fasteners: 3/4 inch diameter pin bolts; TRACK APPURTENANCES.

2.07 EXPANSION JOINT ASSEMBLIES: Maintain less than 1/64 inch difference between elevations of joined rails in environmental temperatures ranging from minus 25 degrees C to plus 70 degrees C.

- A. Expansion joints: Steel or malleable iron; Shield Electric Co.'s Model SE-100. Fabricate as follows:

- 1. Surfaces interfacing with contact rail
  - a. Top: Flat and positioned to form a single plane surface of contact rail.
  - b. Web: Shaped to conform to contact rail.
- 2. Drill bolt holes.
- 3. Key alignment bars.

- B. Bolts, nuts, and washers: ASTM A325, Type 1, galvanized in accordance with ASTM A153.

- C. Cotter pins: ASTM B134.

- D. Shunt cable: Single conductor, insulated, nonshielded 500 MCM, 259 stranded cables; Article 2.09 of this Section.

- E. Cable trough: Rigid, Schedule 40 PVC, six-inch diameter. Tie straps shall be metal-free nylon.

- F. Lubricant: Gulflex No. 2-Moly-EP.

2.08 JUMPER CABLE: Single conductor; insulated; nonshielded type; 750 MCM, 61 strands (Class B). Stranding shall be concentric lay, and conform to ASTM B8. Cable shall conform to ICEA S-66-524 test requirements for 2,000 volts for use at a conductor temperature of 90 degrees C.



- A. Wire: Round, uncoated, electrolytic grade, soft-drawn copper conforming to ASTM B3.
  - B. Insulation: Heat-, moisture-, ozone-, and flame-resistant; concentric; 120 mils thick; filled, thermosetting, cross-linked, nonjacketed polyethylene; conform to NEMA WC7; be either UL-listed for conformance to UL44-VW-1 flame test or certified as passing the flame test specified in IEEE 383; and be legibly marked, on not more than 12-inch centers, with cable manufacturer's name, voltage rating, type, and size, ensuring that data is legible for cable's life under conditions of installation and service.
- 2.09 FLEXIBLE CABLE: Single conductor; insulated; nonshielded type; 350 MCM, 259 strands (Class G); and conform to ICEA S-68-516 test requirements for 2,000 volts for use at a conductor temperature of 90 degrees C. Stranding shall be rope lay with concentric stranded members and conform to ASTM B173.
- A. Conductor: Copper conforming to ASTM B3, and coated with either tin conforming to ASTM B33 or tin-lead alloy conforming to ASTM B189.
  - B. Insulation: Concentric; ethylene propylene, or Contracting Officer- accepted equivalent, conform to NEMA WC8, have 133 percent insulation level, and conform to ASTM D2802.
  - C. Wire: Electrolytic grade, soft-drawn, copper conforming to ASTM B189; coat wire.
  - D. Jacket: Chlorosulfonated polyethylene conforming to ICEA S-19- 81/NEMA WC3, be either UL-listed for conformance to UL44-VW-1 flame test or certified as passing the flame test specified in IEEE 383, and be legibly marked, on not more than 12-inch centers, with cable manufacturer's name, voltage rating, type, and size, and ensuring that data is legible for cable's life under conditions of installation and service.
- 2.10 RISER TERMINAL CABLE ADAPTER ASSEMBLY: Designed to join 350 MCM Class G stranded cables to 750 MCM Class B stranded cables. Cable adapter shall be of one piece construction, tin-plated copper having a conductivity of not less than 62 percent IACS, have current carrying capacity of not less than 1,500 amperes continuous with a maximum temperature rise of 50 degrees C above an ambient temperature of 40 degrees C, and accept three 750 MCM and three 350 MCM insulated cables spaced alternately at equal distances around its periphery. Cable attachment shall be compression type lugs which shall bolt to adapter body. Hardware shall be silicon bronze conforming to ASTM B98, Alloy Number 651, or accepted equivalent. Adapter shall be O. Z. Gedney's Type SF5224, or accepted equivalent. Arrange conductive parts of adapter assembly to be enclosed in an insulated, removable cover which shall protect conductive parts from the elements and prevent contact with energized parts of the assembly.
- A. Lug for 750 MCM Cable: Burndy Co.'s YA-39-2N, or accepted equivalent. Compress lug with a circular type die, and bolt lug to adapter alternately with those for 350 MCM cable.
  - B. Lug for 350 MCM Cable: Burndy Co.'s YA-33-2N, or accepted equivalent. Compress lug with a hi-dent type die, and bolt lug to adapter alternately with those for 750 MCM cable.
  - C. Washers: Stainless steel; Belleville.
- 2.11 CONDUIT AND FITTINGS: Two-inch.
- A. Steel: Hot-dip galvanized and conform to ANSI C80.1 and UL6. Elbows, nipples, couplings, and supports shall be of the same grade of steel as conduit.



## 02000 - Site Work

- B. Fiberglass: Reinforced epoxy conforming to NEMA TC-14A, Type HW, and satisfy UL651 flame test.
- 2.12 CONDUIT-SEALING BUSHING: UL-listed as conduit-sealing device; O. Z. Gedney Co.'s Type CSBG or accepted equivalent.
- 2.13 INSULATOR MOUNTING BRACKET: ASTM A588 corrosion-resistant steel.
  - A. Cap screws for affixing bracket to concrete tie and structure: 3/4 inch diameter, conform to ASTM A307, Grade A, cadmium-plated in accordance with ASTM A165, UNC type.
  - B. Lock and flat washers: Same material and finish as cap screw; size to fit cap screws.
  - C. Dielectric insulation: Coal tar epoxy; Koppers Co.'s Bitumastic 50 or 300M.
  - D. Fabrication: Drill bracket, and coat bottom and sides of bracket which will contact concrete with five to six mils of dielectric insulation.
- 2.14 JUMPER CABLE IDENTIFICATION NAMEPLATES: Stainless steel, circular, have two holes, and be machine-embossed with identifying number and prefix "TP". Type of nameplates, size of nameplates, embossing, and methods of attachment shall be subject to Contracting Officer-acceptance.
- 2.15 EXPANSION BOLTS
  - A. For anchor assembly: WEJ-IT Expansion Products, Inc.'s WEJ-IT, or accepted equivalent.
  - B. For conduit attached to aerial deck: Hilti, Inc.'s Resin Anchor Bolt No. HAS-R M 8x110, or accepted equivalent.
- 2.16 CABLE LUBRICANT: As recommended in writing by cable manufacturer.
- 2.17 INSULATOR CAP/CONTACT RAIL INTERFACE LUBRICANT: Gulflex No. 2-Moly-EP.
- 2.18 CONTACT RAIL:
  - A. Rail head: Either grind or sandblast contact rail. If rail will be ground, heat rail head with propane rosebud-type tip and grind rail head with a hand-held electrical or pneumatic radial grinder and grinding stone until all mill scale and surface irregularities have been removed.
  - B. Rail base: Wire-brush portions of contact rail base, which will rest on insulator cap and those portions which will be within one foot of both sides of insulator, with either an electric or pneumatic grinder having a wire brush attachment; brush removing adhering material and mill scale.
- 2.19 PAINT FOR SUPPORTING HARDWARE AND STRAPS ON AERIAL STRUCTURE AND CABLE REDUCER ASSEMBLIES IN VICINITY OF STATION: Corrosion-inhibiting.
- 3.0 EXECUTION
- 3.01 EXAMINATION
  - A. Ensure that concrete surfaces, where pedestals are installed, have a roughened or scrubbed finish, and laitance, loose material, and coatings interfering with bonding of fresh concrete to hardened concrete are removed.



- B. Ensure that concrete reinforcement for pedestals has been installed as indicated, and that mortar splashings, concrete curing compound, grease, oil, and form release agent has been removed.
- C. Ensure that insulators have been thoroughly cleaned before being installed.
- D. Ensure that surface of concrete, on which insulator will be installed, is smooth and flat.

### 3.02 INSTALLATION

- A. Concrete pedestals: Install no pedestal on concrete joint.
  - 1. Preparation: Position embedded inserts.
    - a. If results of inspection of existing concrete are unsatisfactory, sandblast concrete surfaces on which pedestals will be installed.
    - b. If results of inspection of concrete reinforcement are unsatisfactory, either wire brush or abrasively blast concrete reinforcement.
    - c. Reinforcing steel: Secure against displacement by more than 1/4 inch from indicated position.
    - d. Embed anchor support bracket inserts and insulator inserts within 1/16 inch of top of concrete and within plus or minus 1/8 inch horizontally; secure inserts against displacement.
  - 2. Concrete formwork: CONCRETE FORMWORK.
  - 3. Concrete reinforcement: CONCRETE REINFORCEMENT.
  - 4. Concrete work: CAST-IN-PLACE CONCRETE.
- B. Insulator
  - 1. Preparation
    - a. Remove cap-plug from inserts cast into concrete ties. Wire-brush inserts, and remove contaminants from inserts.
    - b. Drill timber ties to match mounting hole pattern of insulator. Drill lead holes for 5/8 inch diameter hole 1- 3/8 inches deep, and drill 1/2 inch diameter concentric hole an additional 3-1/8 inches. Fill holes with pentachlorophenol.
  - 2. At other than concrete ties, install insulators nearest bottom end of end approaches neither closer than 18 inches to nor farther than 24 inches from bottom end. At concrete ties, install insulators nearest bottom end of end approaches not farther than three feet from bottom end. Install all other insulators on ten-foot centers, plus or minus nine inches. Install insulators on 11-foot centers, plus or minus nine inches, in yard and at secondary tracks. If an insulated joint in CWR is above a tie on which an insulator would be supported, support that insulator on a tie adjacent to the tie above which a joint in CWR exists. Achieve top of contact rail profile by means other than altering height of insulator cone.
    - a. Install 4-3/4-inch high insulators at end approaches, dipped rail sections, and indicated superelevated track.



## 02000 - Site Work

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- b. Install 5-5/16-inch high insulators on mounting bracket on concrete ties and on at-grade slab track.
  - c. Install 6-3/4-inch high insulators on concrete pedestals at direct fixation track and on timber ties.
  - d. Place not more than one inch of shims under insulator. Install neoprene shim directly beneath insulator.
  - e. Torque bolts, cap screws, and lag screws either until lock washer has been completely depressed or to not more than 25 foot-pounds except torque lag screws at timber tie to not more than 20 foot-pounds.
  - f. Completely coat top surface of each insulator cap, and underside of contact rail directly above cap and for one foot each way from insulator, with insulator cap/contact rail interface lubricant.
- C. Contact rail: Arrange rail to the extent that welds will be no closer than 12 inches from insulator.
  - 1. Stock rail
    - a. Sawing: Saw rail at right angles to center line of rail.
    - b. Drilling: Drill each hole in one continuous operation with a power drill. Drill holes to exact diameter and perpendicular to vertical and horizontal axis of rail. Deburr holes. Do not ream holes.
    - c. Welding
      - (1) Method: Exothermically weld.
      - (2) Preparation: Place fireproof blanket on near-by insulator, conduit, and cable.
      - (3) Procedure and rail preparation: In accordance with welding kit manufacturer's instructions.
      - (4) Dressing welds: Grind smooth, remove burrs, and clean. Grind top of rail smooth within plus 0.00 inch or minus 0.01 inch of parent section.
    - d. Allowable deviation from indicated dimensions and positioning
      - (1) Variation in straightness in 39 feet, before field bending for curves: One inch.
      - (2) Twist in a length of rail: Three degrees.
      - (3) Horizontal and vertical mounting positioning of contact rail: 1/8 inch.
      - (4) Vertical-longitudinal parallel offset in contact rail alignment, with respect to CWR alignment: 1/8 inch in 40 feet.
      - (5) Exact alignment of rails shall ensure difference in top surfaces of abutting rails when rails are being welded: Not more than 1/64 inch.
      - (6) Gap width between rail ends at splice bar locations: Not more than 3/16 inch.
      - (7) Difference in elevation of joined rails at expansion joints on contact surface: Less than 1/64 inch.
      - (8) Variation of contact rail gaps from indicated positions: Six inches.





- (9) Vertical clearance between contact rail and ground, whether ground be concrete, asphalt, wood, or ballast: Not less than 3-1/2 inches.
    - (10) Horizontal clearance between bottom end of end approach and concrete and ballast: Not less than eight inches in every direction.
    - (11) Bolt end approaches to contact rail only when temperature of contact rail is between 75 degrees F and 90 degrees F on aerial structures and at-grade construction, and when temperature of contact rail is between 50 degrees F and 70 degrees F in subway structures. Vertical distance between top of CWR and top of contact rail end approach at it lowest end shall not exceed 1-1/2 inches.
    - (12) Contact rails shorter than 25 feet shall not be welded.
    - (13) Tolerances shall not be cumulative.
  2. End approaches: No. 2 rail. Fabricate rail to accommodate slopes; slope eight feet long ramps 1.19 degrees, and slope four feet long ramps 2.39 degrees.
    - a. Assemble splice bar on rail. Place compression fastener nut on field side of contact rail.
    - b. Set end approach in splice bar.
    - c. Align top surface of rail and tighten nuts to torque specified by compression fastener manufacturer.
    - d. Grind head at joint to ensure smooth transition.
  3. Dipped rail sections
    - a. Bend 39-foot lengths of contact rail, which will be dipped, with a rail bender.
    - b. Exothermically weld end approach to contact rail.
- D. Anchor assembly
  1. Assembly procedure: In accordance with anchor assembly manufacturer's printed instructions.
  2. Cleaning inserts: Remove cap-plug from inserts cast into concrete ties before installing anchor bracket, and wire- brush inserts to remove contaminants.
  3. Insulator clevis ends: Assemble with 3/4 inch bolts and locknuts or rivet-cotter pin.
  4. Tie down bracket: Attach to inserts in concrete pedestals or ties with 3/4 inch capscrews and lock washers. Attach to timber ties with lag screws and lock washers.
  5. Offset ends with anchor clamp eye bolt: Assemble after strain insulators have been attached to tie-down brackets. Use 3/4 inch eye bolts, washers, and lock nut. Torque anchor clamp bolts to contact rail to 300 foot-pounds.
- E. Expansion joint assembly
  1. Means of attachment to contact rail ends: Bolt in accordance with expansion joint manufacturer's printed instructions.





## 02000 - Site Work

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- a. Grind contact rail mating surfaces smooth, and to white metal.
    - b. Lubricate: Apply uniformly thick coat of lubricant over mating surfaces of sliding joint assembly.
    - c. Operation condition: Able to be slid along rail by manually-applying 50 foot-pounds of force to a four-foot No. 5 rebar inserted between end of contact rail and expansion joint.
  2. Shunt cable: Exothermically weld to outboard side of contact rail where rail interfaces with protective cover bracket.
  3. Protective trough: Ensure that no part of cable rests on concrete. Slot top of troughs at ends of cable to branch off to contact rail. Tie shunt cable to trough.
- F. Jumper cable system
  1. Location: Trackside conduit.
  2. Termination: In riser terminal cable adapters or cable reducers.
  3. Cable and conduit
    - a. Preparation
      - (1) Pull a wire brush, swab, and mandrel through conduit to remove extraneous matter.
      - (2) Apply corrosion inhibitor to threads of four-inch galvanized steel nipples.
      - (3) Ensure that cable contains no kinks.
      - (4) Ensure that radii of bends in cable are larger than minimum recommended by cable manufacturer.
    - b. Installation
      - (1) Pull cable directly into dry conduit from coils or reels on which received. Install no cable which has lain on the ground.
      - (2) Pulls shall be in one direction.
      - (3) Ensure that cable is not tight against bushings and fittings.
      - (4) If cable has been pulled by pulling grips, remove damaged cable ends as soon as cable has been installed.
      - (5) Do not pull cable with its end open. Maintain rubber tape on cable end.
      - (6) Seal ends of installed cable preventing entry of moisture.
      - (7) Identify ends of cable before making connections at riser terminal cable adapters and cable reducers.
    - c. Jumper cable identification plate: Install at each end of each conduit.
  4. Riser terminal cable adapter connections
    - a. Function: Connect 350 MCM flexible cable to 750 MCM jumper cable.
    - b. Contact rail cable conduit



- (1) Terminate with sealing bushing. Ensure that sealing bushing holds cable against movement in both directions, and makes a watertight seal.
  - (2) Terminate 350 MCM flexible cable and 750 MCM jumper cable at riser terminal cable adapter with compression lugs for 350 MCM and 750 MCM cable.
5. Flexible cable to rail connection
  - a. Exothermically weld cable to contact rail in accordance with welding kit manufacturer's instructions.
  - b. Length of flexible cable: Allow for drip loop, distance to rail connection point, and seven inches for rail expansion.
  - c. Ground clearance: Allow no installed flexible cable to contact surfaces between contact rail and adapter.
6. Conduit on aerial structure and cable reducer assemblies in vicinity of Station.
  - a. Conduit: Two-inch fiberglass type.
  - b. Bending radius of conduit: Not less than 18 inches.
  - c. Fasten conduit runs to aerial structure deck: With pipe straps and expansion bolts as specified in Article 2.15 of this Section, and spaced no more than four feet apart. Embed expansion bolt not more than two inches.
  - d. Cut conduit square, and remove burrs, sharp edges, and contaminants. Threadless joints will be permitted only if threaded fittings can not be installed. Joints shall be waterproof. Cap conduit ends.
  - e. Bends and offsets may be field-fabricated, but no split, deformed, or damaged conduit shall be installed.
  - f. Painting: Paint supporting hardware and straps.
- G. Protective cover and support bracket
  1. Support bracket
    - a. Attach brackets to contact rail and fasten bolts in accordance with protective cover manufacturer's printed installation instruction.
    - b. Except in yard and at secondary tracks, install support brackets at five-foot intervals but not nearer than seven inches from an insulator. In yard and at secondary tracks, support brackets neither less than three feet nor more than five feet apart, and not nearer than seven inches from an insulator.
    - c. At dipped rail and end approach sections, attach bracket to contact rail and adjust height of protective cover with adjustable support bracket.
  2. Protective cover: Install only after all requirements specified in Articles 3.02C, D, and E of this Section have been completed, and have been accepted by Contracting Officer. Install lengths of protective cover not shorter than four feet.



## 02000 - Site Work

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- a. Place cover in a manner which will result in end of cover projecting not more than 12 inches beyond end of contact rail.
- b. Attach cover to installed support bracket in accordance with cover manufacturer's printed installation instructions.
- c. Cut cover to neat shape, and to accommodate electrical connections.
- d. Apply sealant to raw edges of drilled holes and to field-sawn cuts.

3.03 FIELD TESTING: Test installed contact rails and welds in presence of Contracting Officer. Notify Contracting Officer 48 hours before test time. Furnish instruments, labor, and tools for testing.

A. Contact rail

1. Mechanical strength: Test rail after welds have cooled to ambient temperature.
  - a. Jack or lift welded contact rail at center of rail joint to an elevation five inches above level at which insulators will support rail.
  - b. Remove welds showing visible cracks. Cut rail three inches on both sides of weld, then weld rail. Repeat test until no visible cracks exist.
2. Electrical resistance test (TW-83)
  - a. Method: Ohmmeter measurement.
  - b. Test section of contact rail
    - (1) Composition: Three feet of contact rail with welded joint centered in section.
    - (2) Quantity: 20
    - (3) Selection: By the Contracting Officer.
  - c. Reference of comparison: Three-foot length of solid contact rail.
  - d. Instrumentation
    - (1) Digital low resistance ohmmeter (DLRO); Biddle's Model No. 247350, or accepted equivalent.
    - (2) Calibration: Certified by testing laboratory at intervals of not more than six months.
  - e. Procedure: Mount probes in a holding vise or jig, and ensuring that ohmmeter probe spacing is accurate to within one percent of required spacing. Hand wire brush rail to the extent that electrical connections will be tight.
  - f. Position vise or jig to ensure that weld will be centered within 1/8 inch.
  - g. Read microhms across test section of contact rail and across three-foot length of solid contact rail.
  - h. Resistance through weld of test section: be not more than resistance of solid contact rail section.



- i. Remove welds exhibiting resistance more than that exhibited by solid contact rail sections. Cut rail three inches on both sides of weld, then reweld rail. Retest until resistance reading through weld does not exceed allowable.
      - j. If more than 10 percent of welded joints tested are defective, test conductivity of every completed contact rail weld joint.
    - B. Contact rail system: Contact rail alignment shall be demonstrated to be within the tolerances specified in Article 3.02C8 of this Section.
      - 1. Alignment test: Check for conformance to allowable tolerances.
      - 2. Insulation resistance test (TW-85)
        - a. Test installed contact rail system in sections without insulated cables welded to contact rail and with rail and insulators clean and dry.
        - b. Test with electronic 5,000-volt megohmmeter.
        - c. Insulation resistance: Not less than 80 megohms to ground per 1,000 feet of contact rail.
      - 3. High-potential test (TW-86)
        - a. Test the complete contact rail system consisting of jumper cable, flexible cable, expansion joint shunt cable, and contact rail for insulation integrity by means of a high-potential test.
        - b. Test with electronic 5,000-volt megohmmeter.
        - c. Insulation resistance: Not less than 80 megohms to ground per 1,000 feet of contact rail.
  - 3.04 ADJUSTING AND REPAIRING
    - A. Remove defective work and material in accordance with the respective manufacturer's printed recommendations. Furnish and install new products.
    - B. Retest new products.
    - C. Remove chipped, broken, and cracked insulators and replace with unchipped, unbroken, and uncracked insulators.
  - 3.05 CLEAN-UP: Deliver surplus materials, including cable, connectors, conduit, fittings, and equipment, to Contracting Officer.
- END OF SECTION 02850j



## SECTION 02850k

### TRACTION POWER BONDS

- 1.01 DESCRIPTION: This specification covers the furnishing and installation of products for bonding joints in running rail. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.02 REFERENCED DOCUMENTS
  - Industry Standards: American Society for Testing and Materials (ASTM): B173 Rope-Lay-Stranded Copper Conductors having Bunched Stranded Members
- 1.03 QUALITY CONTROL: Construction Equipment
  - A. Rail grinder: Have vitrified grinding wheel.
  - B. Rail cleaner: Nontoxic, and capable of removing grease, rust, scale, and dirt.
- 2.0 PRODUCTS
  - 2.01 CABLE FOR PIN-TYPE BOND: Consist of 500 MCM, 259 strands, single conductor, insulated, nonshielded cable specified in CONTACT RAIL SYSTEM.
  - 2.02 CABLE FOR WELDED-TYPE BOND: Bare, annealed copper 250 MCM, single conductor, and stranding conforming to ASTM B173 Class G, and have swaged steel sleeve or ferrule type welding lugs designed to enable cable ends to be exothermically welded to running rails; ERICO Products Inc.'s Part No. PBC1-2W-13.
  - 2.03 PIN-TYPE TRACTION POWER BOND: Fit 500 MCM cable and one inch diameter hole in rail; Erico Products, Inc.'s No. B-188-3Q slotted rail terminal having pin, washer, and lock nut, or accepted equivalent.
  - 2.04 PROTECTIVE COATING: Dearborn Chemicals Co.'s NO-OX-ID, or accepted equivalent.
- 3.0 EXECUTION
  - 3.01 PREPARATION: Grind bonding surfaces of rail; and remove scale, rust, grease, and dirt.
  - 3.02 PIN-TYPE BOND
    - A. Position bond further than six inches from a joint bar, further than 18 inches from center of a welded joint, and further than six inches from each other.
    - B. Drill one inch diameter hole at the neutral axis of the rail, perpendicular to the vertical and longitudinal axis of the rail, but not through rail brand. Holes shall be bright, clean, dry, and free from rust, burrs, and foreign substances affecting conductivity of joint and soundness of rail.



- C. Drive a lubricated tapered punch, of a size recommended by bond manufacturer, through slotted rail terminal; then insert a correctly-sized drift pin. Install washer and torque lock nut in accordance with nut manufacturer's printed recommendation.
- D. Connect cable to terminal by either compression method or exothermically welding; connect in accordance with connection manufacturer's printed recommendations.
- E. Peen installed bonds.
- F. Place cables along bottom flange of running rails and secure cables to flange with cable clips.

3.03 WELDED-TYPE BOND

- A. Position bond on field side of rail heads around bolted joints.
- B. Exothermically weld bond in accordance with weld manufacturer's printed instructions, ensuring that weld will be mechanically and electrically continuous.
- C. Apply protective coating to rail head bond in accordance with coating manufacturer's printed instructions.

- 3.04 FIELD TESTING: Test welded bond by hammer and striker test, and in accordance with welding kit manufacturer's printed instructions. If bond is defective, remove bond, furnish and install new products for bonding joints, and test new bond.

END OF SECTION 02850k



## SECTION 02850I

### CROSSWALK AND GRADE CROSSING

- 1.01 DESCRIPTION: This specification covers the furnishing and installation of products for crosswalk and grade crossing. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.02 REFERENCED DOCUMENTS
- Industry Standards
1. American Railway Engineering Association (AREA): Manual of Railway Engineering (MRE): Chapter 3, Part 9, Specifications for Treatment
  2. American Society for Testing and Materials (ASTM)  
A153 Zinc Coating (Hot Dip) on Iron and Steel Hardware  
A307 Carbon Steel Externally and Internally Threaded Standard Fasteners  
A491 Asphalt Mastic (Asphalt Cement, Mineral Filler, Mineral Aggregate) for use in Waterproofing
  3. American Wood Preservers Association (AWPA): M4, Standard for the Care of Preservative-Treated Wood Products
- B. Governmental Standards
1. Texas Department of Transportation Standard Specifications, Construction of Roads and Bridges
- 2.0 PRODUCTS
- 2.01 CROSSWALK
- A. Timber: Number 2 pressure-treated yellow pine. Stamp each timber AWPI DRY and AWPI LP-2 before treating timber. Reduce moisture content of decking and decking support members to not more than 19 percent by weight by kiln drying before treating those products. Maintain water-absorbing property which is not greater than that of untreated lumber.
- B. Hardware
1. Fastener for securing deck timbers to cross beams: Joist hanger nail galvanized in accordance with ASTM A153; Cleveland Specialty Co., or accepted equivalent.
  2. Fastener for securing cross beams to support beams: Galvanized dome head drive spike or washer-head timber screw; Lewis Nut and Bolt Co.'s Sealtite, Cancar Div. of Textron Industries, Inc.'s Torx Truss Washer Head, or accepted equivalent.



3. Fastener for securing support beams to concrete ties: Threaded hook bolt galvanized in accordance with ASTM A153 after threading; Lewis Bolt and Nut Co.'s Sealtite having Sealtite washer nut and hook lock plate, or accepted equivalent.
4. Fastener for securing flangeway timbers to direct fixation concrete: Anchor bolt, conforming to ASTM A307 and hot-dip galvanized in accordance with ASTM A153, and concrete insert.
- C. Preservative solution for treating field-cut timber: 0.9 Osmose Solution, or accepted equivalent.
- D. Anti-slip coating: Two-part epoxy resin and graded aggregate dispersed throughout epoxy. Not less than 100 percent of aggregate shall pass the No. 30 sieve and not less than 95 percent shall pass the No. 50 sieve; Tasa Corp., or accepted equivalent.
- E. Sealant: Asphalt mastic conforming to ASTM D491, or accepted equivalent.
- F. Bonding agent: Preco Co.'s Rockweld C, or accepted equivalent.
- G. Concrete formwork: CONCRETE FORMWORK.
- H. Concrete reinforcement: CONCRETE REINFORCEMENT.
- I. Portland cement concrete: Class 3000 PORTLAND CEMENT CONCRETE.
- J. Grout: Nonshrink type conforming to CRD C621.
- K. Asphaltic concrete
  1. Bituminous prime coat: Cutback asphalt MC250; GDOT SSCRB Section 412.
  2. Bituminous tack coat: GDOT SSCRB Section 413.
  3. Base course: GDOT SSCRB Article 828.05; Asphaltic Concrete "Base".
  4. Surface course: GDOT SSCRB Article 828.03; Asphaltic Concrete "".
- L. Fabrication
  1. Orient timber heartwood face downward.
  2. Cut beams square. Bevel outside ends of timber decking and flangeway timbers four inches at 45 degrees.
  3. Drill holes for anchor bolts; countersink ends of holes for washers and nuts. Drill no holes the centerline of which is less than two inches from edge of timber.
  4. Pressure-treat cut and drilled timbers by the Osmose K-33 method in accordance with AWPI; develop preservative retention of not less than 0.25 pound per cubic foot.
  5. Assemble crosswalk with heartwood facing downward and ends of decking timbers, cross-beams, and support beams being aligned. Nail decking to cross-beams with two nails per timber.

## 2.02 GRADE CROSSING

- A. Timber: Maple, gum, or birch.





## 02000 - Site Work

- B. Fastener for securing timber flangeway to wood tie: Dome-head drive spike; Lewis Nut and Bolt Co.'s Sealite, or accepted equivalent.
- C. Preservative: Creosote type.
- D. Asphaltic concrete
  - 1. Bituminous prime coat: Cutback asphalt MC250; GDOT SSCRБ Section 412.
  - 2. Base course: GDOT SSCRБ 828.05; Asphaltic Concrete "Base".
  - 3. Surface course: GDOT SSCRБ 828.03; Asphaltic Concrete "".
- E. Fabrication
  - 1. Orient flangeway timber heartwood to face downward.
  - 2. Cut timbers square except bevel ends of flangeway timbers, which will not abut other timber, four inches at 45 degrees. Notch flangeway timber to clear tie plate hardware by not less than 1/2 inch.
  - 3. Pressure-treat cut and drilled timbers in accordance with AREA MRE Chapter 3, Part 9.

### 3.0 EXECUTION

#### 3.01 EXAMINATION: Examine surfaces on which crosswalk and grade crossing will be placed.

- A. Ensure that track has been raised and aligned to its final alignment and profile and has been accepted by the Contracting Officer.
- B. Ensure that ballast has been dressed to final cross section.

#### 3.02 SURVEYING: Survey installed CWR; determine its horizontal and vertical track alignments.

#### 3.03 PREPARATION

- A. Remove loose material from tie, rail, and rail fastenings.
- B. If wood products have been field-drilled and field-cut, coat drilled and cut surfaces with preservative solution immediately after holes have been drilled and surfaces have been cut.

#### 3.04 INSTALLATION

- A. Anchor timbers; seat solidly.
- B. Drive spikes and nails, and torque screws; make timber connections rigid.
- C. Fill space between countersunk timber and bolt and washer with sealant.
- D. Apply not less than 1/16 inch of anti-slip compound to wearing surfaces of flangeway timber and crosswalk timber decking in accordance with anti-slip manufacturer's printed instructions.
- E. Place concrete formwork in accordance with CONCRETE FORMWORK. Place concrete reinforcement in accordance with CONCRETE REINFORCEMENT. Place concrete in accordance with CAST-IN-PLACE CONCRETE. Broom- finish concrete surface in accordance with UNFORMED- CONCRETE FINISHES.
- F. Tolerances



## 02000 - Site Work

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1. Top of flangeway and timber, vertical depression below top of rail: plus 1/4 inch, minus zero.
2. Clearance between sides of flangeway and timbers and edge of rail: plus 1/4 inch, minus zero.
3. Difference in elevation between surfaces of flangeway and timber and surface of abutting paving: 1/8 inch.

END OF SECTION 02850I

END OF SPECIFICATION SECTION 02 – Site Work



## 02000 - Site Work

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## SECTION 03100

### CONCRETE FORMWORK

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of structural cast-in-place concrete formwork. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.1 Quality Assurance :
  - 1.1.1 Regulatory Agency Requirements
    - a. "Recommended Practice for Concrete Formwork," publication ACI 347 of the American Concrete Institute.
  - 1.1.2 The design and construction of all formwork for reinforced concrete superstructures shall comply with the requirements of ACI-318-83.
- 2.0 PRODUCTS:
  - 2.1 Form Materials shall conform to ACI 301 and shall be made especially for concrete form use.
    - 2.1.1 Corrugated or Formed Steel Sheets: ASTM A 361, G90 Coating, with depth of corrugations not less than 1/2 inch.
    - 2.1.2 Plywood: U.S. Product Standard PS-1 "B-B (Concrete Form) Plywood", Class I, Exterior Grade. Minimum thickness shall be 3/4 inch.
    - 2.1.3 Cylindrical Columns and Supports: Round-section members with paper or fiber tubes, constructed of laminated plies using water-resistant adhesive with wax-impregnated exterior.
    - 2.1.4 Pan Type: 16-gauge steel with 1/4-inch thick concrete form hardboard, or fiberglass at least 0.11 inch thick.
    - 2.1.5 Form Lumber: Good quality, sound, straight and even seasoned, clean lumber. Form in contact with concrete surfaces which will remain exposed shall be dressed T and G width not exceeding 8" or 5 ply moisture resistant concrete form plywood not less than 9/16" thick free from knots or other defects which will deface the concrete. Exposed surfaces may also be formed with regular form lumber and metal lining. Use plywood or lined forms where smooth surface finish is specified.
    - 2.1.6 Void Forms: Moisture-resistant treated paper faces, biodegradable.
  - 2.2 Formwork Accessories:
    - 2.2.1 Form Ties: Form ties shall be metal, factory-fabricated, removable or snap-off and will leave holes not less than 1/4 inch no more than 1 inch deep.
    - 2.2.2 Form Coating shall be industrial colorless material that will not stain concrete, absorb moisture, or impair natural bonding.



## 03000 - Concrete

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- 2.2.3 Fillets for Chamfered Corners shall be wood strips or rigid plastic type.
- 2.2.4 Dovetail Anchor Slots shall be galvanized steel material with release-tape-sealed slots and bent tab anchors, securable to concrete formwork.
- 2.2.5 Flashing Reglets shall be galvanized steel with release-tape-sealed slots and alignment splines for joints, securable to concrete formwork.
- 2.2.6 Anchorages, Spikes, Nails, and Lag and Through Bolts shall be as required to maintain formwork in place.
- 3.0 EXECUTION:
- 3.1 Inspection: Forms shall be cleaned and reconditioned between usages. Temporary ports shall be provided in formwork to facilitate cleaning and inspection.
- 3.1 Preparation:
  - 3.2.1 Formwork shall be constructed to maintain tolerances in accordance with ACI 301.
  - 3.2.2 Form coating shall be applied prior to placing reinforcing steel, anchoring devices, and embedded items. Do not apply form coating where concrete surfaces are scheduled to receive special finishes.
  - 3.2.3 Chamfer Strips shall be provided on external corners that will be exposed.
  - 3.2.4 Product Handling
    - A. Protection
      - 1. Protect formwork materials before, during and after installation.
      - 2. Protect installed work and materials of other trades.
    - B. Replacement Damaged formwork shall be repaired or replaced as approved by the Contracting Officer at no additional cost to the Contracting Officer.
- 3.3 Form Removal: Forms shall be removed in a progressive manner that will prevent injury to the concrete.

END OF SECTION 03100



## SECTION 03200

### CONCRETE REINFORCEMENT

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of concrete reinforcement. Products shall be in accordance with the product manufacturer's recommendation. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
  - 2.1 Reinforcement Materials:
    - 2.1.1 Billet-Steel Reinforcing Bars: ASTM A 615, Grade 40 or 60 steel as required in the request for work, plain or deformed bars, uncoated or galvanized finish.
    - 2.1.2 Welded Steel Wire Fabric: ASTM A 185 for plain type and ASTM A 497 for deformed type fabric.
    - 2.1.3 Stirrup Steel: ASTM A 82
  - 2.2 Reinforcement Accessories:
    - 2.2.1 Wire Ties: 16 gauge black annealed wire.
    - 2.2.2 Chairs, Bolsters, Bar Supports, and Spacers shall be provided in conformance with ACI SP-66. Supports for formed surfaces exposed to view shall be plastic protected wire or stainless steel. Precast concrete if used for bar supports, shall be wedge-shaped, not larger than 3-1/2 inches by 3-1/2 inches in thickness and with an embedded hooked tie wire for anchorage.
    - 2.2.3 Temperature and Shrinkage Steel for Structural Floor and Roof Slabs:  
Consist of #3 bars 12" o.c. in roof slabs and 18" o.c. in floor slabs. Position at right angles to main reinforcement.
- 3.0 EXECUTION:
  - 3.0.1 Product Handling
    - A. Store in location to prevent rusting.
    - B. Protect reinforcement before, during, and after installation.
    - C. Insure proper identification after bundles are broken.
  - 3.0.2 Code Requirements
    - A. Identification of Metal Reinforcement. Deliveries will be rejected unless:
      - 1. All reinforcing bars are identifiable as to point of origin, grade of steel and size.
      - 2. All bundles or rolls of cold drawn steel wire reinforcement are securely tagged to identify the manufacturer, the grade of steel and the size.



## 03000 - Concrete

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- B. Details of concrete reinforcement not covered herein shall be in accordance with "Building Code Requirements for Reinforced Concrete: (ACI-318-83) and "Details and Detailing of Concrete Reinforcement" (ACI-315), latest editions and the Concrete Reinforcing Steel Institute Manual on "Placing Reinforcing Bars" (CRSI-76)

### 3.1 Regulations:

3.1.1 Reinforcement Detailing and Placement shall conform to ACI 318-83.

3.1.2 Laps or Splices shall conform to ACI 318-83.

3.1.3 Welding shall comply with AWS D1.4.

### 3.2 Installation:

3.2.1 Reinforcement shall be free from loose or flaky rust and mill scale.

3.2.2 In Slabs, Beams, and Girders, reinforcing steel shall not be spliced at points of maximum stress.

3.2.3 Dowels and Tie-Bars in slabs on grade shall be placed at right angles to construction joints.

3.2.4 Wire Fabric Reinforcement shall be continuous between expansion, construction, and contraction joints in slabs on grade, between expansion joints in other slabs.

3.2.5 Reinforcing Bars shall not be continuous through expansion joints but shall be 2 inches clear from the joint.

3.2.6 Concrete Encased Structural Steel Members: Structural steel beams and girders fully encased in concrete, shall be wrapped with 3 x 3 inch mesh of 10 gauge galvanized wire, applied around the steel over spacers to provide 3/4 inch clearance from the metal. The edges of the mesh shall be lapped and tied and shall have all loose ends made fast. On members no greater than 20 inches in depth, beam soffit clips may be used in lieu of wrapping with mesh. The reinforcement of the concrete encasement for columns, struts and similar vertical steel members shall unless otherwise specified consist of 4 vertical 1/2" round bars placed near the corners and laterally with 3/8" round hoops spaced on not over 12" centers.

END OF SECTION 03200



## SECTION 03250

### CONCRETE ACCESSORIES

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of concrete accessories. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS
  - 2.1 Joint Materials:
    - 2.1.1 Hot-Poured Rubberized Asphalt Compound: ASTM D 1190.
    - 2.1.2 Polyurethane-Base Elastomeric.
    - 2.1.3 Liquid Neoprene.
  - 2.2 Sealer
    - 2.2.1 Joint Sealer: Shall be two-component type synthetic rubber sealer consisting of a polysulphide liquid polymer base compound and a separately packaged curing agent. Compound shall convert to a permanently flexible rubber like sealer having the following properties:
      - A. Pot life after adding curing agent and thorough mixing 2-6 hr.
      - B. Complete curing time at 75 degrees Fahrenheit 24-48 hr.
      - C. Hardness "shore A" after 24-48 hr. curing 20-40
      - D. Elongation at break Min. 200%
      - E. Adhesion to peel (ASTM Standard) Min. 25 psi
      - F. Resistance to shear 150-250 psi
      - G. Ultimate tensile strength 150-250 psi
      - H. No appreciable sagging in 3/8 inch vertical joints
      - I. Color to match existing material.
    - 2.2.2 Primer as recommended by the manufacturer
  - 2.3 Waterstop:
    - 2.3.1 Polyvinyl Chloride: 1,750 psi minimum tensile strength, working temperature range from minus 51° F to plus 175 °F , ribbed flaps on one side only.
    - 2.3.2 Extruded Neoprene: 2,000 psi minimum tensile strength, 60 Shore A hardness, flush or recessed from joint.





## 03000 - Concrete

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- 2.3.3 Expansion joints: (Superstructure and exterior) premoulded (Bituminous, fibre type) ASTM D-154 Type X
- 2.3.4 Acoustic Form Lining: 2-inch thick minimum, tectum, insucpack, Forex or approved equal.
- 3.0 EXECUTION:
- 3.1 Preparation: All surfaces of joints to which sealer is to be bonded shall be clean, dry, and free of loose concrete, dirt, oil, or other foreign material.
- 3.2 Application:
- 3.2.1 All Joints shall be in accordance with ACI 318.
- 3.2.2 Accessible Edges of expansion joint shall be sealed with sealer.
- 3.2.3 The Ambient Temperature shall be between 50 and 100 F when the primer and joint sealing compound are applied.
- 3.2.4 Contraction Joints shall have a minimum width of 1/8 inch and a depth of 1/4 the slab thickness or 1-1/2 inches minimum, whichever is greater.
- 3.2.5 Construction Joints shall be doveled construction.
- 3.2.6 Expansion Joint Filler shall be installed below the finished floor with a temporary wood strip to form a groove not less than 3/4 inch deep.
- 3.2.7 Waterstops shall be installed so as to form a continuous water-tight diaphragm. Splices shall be done according to manufacturer's recommendation.

END OF SECTION 03250



## SECTION 03300

### CAST-IN-PLACE CONCRETE

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of cast-in-place concrete. Products shall be as directed by the Contracting Officer.
- 2.0 PRODUCTS :
  - 2.1 Concrete Admixtures:
    - 2.1.1 Air-Entraining Admixture: ASTM C 260. The specifications will indicate where an air-entraining admixture is required
    - 2.1.2 Accelerating Admixture: ASTM C 494, Type C.
    - 2.1.3 Water-Reducing or Retarding Admixture: ASTM C 494, Type D.
    - 2.1.4 High Range Water Reducers (HRWR): ASTM C 494, Type F or G.
  - 2.2 Concrete Mixture:
    - 2.2.1 Cement: ASTM C 150, Type I.
    - 2.2.2 Aggregates
      - A. Fine Aggregates
        - 1. Sand for Concrete Mixtures      ASTM C-33
      - B. Coarse Aggregates
        - 1. Crushed Stone or Gravel    ASTM C-33;  
ACI 318  
Par. 403
    - 2.2.3 Water: Potable, free from deleterious substances to ACI 318.
    - 2.2.4 Proportion of Cement, Aggregate, and shall comply with ACI 318.
    - 2.2.5 Normal concrete shall have a compressive strength (28 day) of 4,000 psi, entrained air by volume shall be 6 percent, and the slump shall be a maximum of 4 inches and a minimum of 1 inch.
    - 2.2.6 Structural Lightweight Concrete (Structural slabs, roof fill, floor fill, fireproofing).
      - 2.2.6.1 Lightweight concrete shall have a compressive strength (28 day) as follows:
        - A. Strength of concrete for structural slabs and fireproofing shall be as required.
        - B. Strength of concrete shall be 3000 psi for the following locations:
          - 1. As gradient fill on roof slabs



## 03000 - Concrete

2. On depressed floor slabs when top of slabs at levels more than two (2) inches below finished floor level; top of fill depressed one (1") inch to received top dressing
3. At intermediate platform levels for steel stairs.

### 2.2.6.2 Lightweight concrete shall conform to the following requirements;

- 2.2.6.2.1 The lightweight aggregate shall be produced by the rotary method and shall conform to the requirements of ASTM C330 (latest revision), shall consist of size 3/4" to No. 4.
- 2.2.6.2.2 The concrete produced shall have a minimum ratio,  $F_{sp}$ , of splitting tensile strength to the square root of compressive strength, equal to 6.0, as determined by "Method for Splitting Tensile Strength of Cylindrical Concrete Specimens (ASTM C496) and ASTM C39.
- 2.2.6.2.3 The concrete shall not exceed an air dry unit weight of 115 lbs. per cubic foot as measured in accordance with "Test for Unit Weight of Structural Lightweight Concrete:, ASTM C567. The wet unit weight of the fresh concrete shall be within  $\pm 3$  lbs.. of the wet unit weight which is to be determined and established from the preliminary tests or prequalified mixes.
- 2.2.6.2.4 Slump of concrete, as determined by ASTM C143, shall not exceed 4 inches.
- 2.2.6.2.5 Concrete shall have an air entraining admixture conforming to ASTM C260, producing an air entraining not to exceed 6% and not less than 4%, as determined by ASTM C173.

### 2.3 Concrete Accessories

#### 2.3.1 Lightweight Concrete (Fill)

- A. Lightweight concrete used as fill shall be composed of lightweight coarse aggregate, fine aggregate, proper water and cement ratio, with a minimum compressive strength of 700 psi at twenty-eight days.
- B. Lightweight concrete is required at the following location:
  1. As gradient fill on roof slabs.
  2. On depressed floor slabs where plans indicate top of slab is more than 2 inches below finished floor level, top of fill depressed 1 inch to receive top dressing.

#### 2.3.2 Bonding Agent shall be two component epoxy resin, two component polysulphide-epoxy, polysulphide polymer epoxy, or polysulphide polymer epoxy resin.

#### 2.3.3 Vapor Barrier shall consist of 10-mil polyethylene sheet, complying with ASTM C 171, or heavy kraft papers laminated together with glass fiber and overcoated with polyethylene.

##### A. Where Vapor Barrier is Required

All slabs on grade unless otherwise specified shall be constructed as follows: After the surface to be paved has been excavated or filled in and graded to the proper levels, the surface shall be well tamped, then covered with 3/4-inch porous fill consisting of broken stone or gravel or as specified. This layer shall be thoroughly wet down and compacted until the surface is firm and unyielding. Over this fill, deposit slabs of thickness' indicated.

##### B. Vapor Barrier Requirement



1. For all interior slabs on grades, except Pipe-Duct, crawl and dead space, place Moistop vapor barrier as manufactured by Fortifiber Corp., or equal, over well tamped porous fill.
  2. Where porous fill is not required place Moistop or equal, over well tamped sub-grade. For application of Moistop vapor barrier or equal, see: manufacturer application specification.
- 2.4.3 Floor Hardener:
- 2.4.3.1 Metallic Floor Hardener: Magnesium fluosilicate or zinc fluosilicate with water.
  - 2.4.3.2 Non-Metallic Floor Hardener shall be used when hardened floor is subject to light or medium floor traffic.
- 2.4.4 Acoustic Form Lining
- 2-inch thick minimum, Tectum, Insulpack, Porex or approved equal.
- 3.0 EXECUTION:
- 3.1 Concrete Placement:
- 3.1.1 Formwork, Reinforcing Steel, and Embedment Items shall be inspected before placing concrete.
  - 3.1.2 Concrete Placement shall comply with ACI 304 and 301.
  - 3.1.3 Cold Weather Placing shall be in compliance with ACI 306. Concrete mixture temperature shall be not less than 50° F.
  - 3.1.4 Hot Weather Placing shall be in compliance with ACI 305. Concrete mixture temperature shall be not more than 80° F.
- 3.2 Concrete - Inspection and Testing
- 3.2.1 Contracting Officer will require that a certified member of their staff supervise the testing of the materials and the inspection of concrete construction, to check that all required tests are made and laboratory tests are submitted, to order the Contractor to make such changes of the mix of concrete required to produce concrete of the necessary strength, to report to the Director, Facilities Operations any deviation from the requirements of the Code, as indicated by records of inspection and reports of test.
- 3.3 Contractor's Responsibility - Concrete
- 3.2.1 The Contractor will receive a copy of all reports prepared by the Laboratory and their technicians and a copy of the daily concrete reports prepared by the Contracting Officer concrete inspectors.
  - 3.3.2 The Contractor will be afforded an opportunity to review all reports and mix data and submit to the Contracting Officer recommendations in changing the mixes, provided they conform to the code and Specifications. Any testing required because of changes in materials or proportions of the mix required by the Contractor, as well as any extra Testing of concrete or materials occasioned by the failure to meet specification requirements, shall be at the Contractor's expense. The Contractor at any time can arrange to have independent tests made at his own expense, by an Approved Laboratory, and submit his report and recommendations to the Contracting Officer
  - 3.3.3 The tests and inspections as provided in the Code, do not in any way relieve the Contractor of his responsibility to construct, in accordance with specifications, and to use standard methods of



## 03000 - Concrete

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construction at all times, safeguarding the public, workmen and structure. The Contractor shall be solely responsible for the physical control of the materials and concrete mixes, and shall see that such mix design, tests and controls are in accordance with the Code and Specifications.

- 3.3.4 Exercise extreme care in selecting the mixing plant and check whether the plant has the proper equipment. Visit the plant periodically and take whatever steps are necessary to assure compliance with the contract documents and the Code, and ASTM. C94, Specification for Ready-Mixed Concrete.
- 3.3.5 It shall be the Contractor's complete responsibility to adjust, alter and correct any controls necessary of material and concrete operation based upon tests and inspections made by the Contracting Officer or his own independent tests. If, during the course of the concrete operations, more cement is needed per cubic yard above the amount specified herein, provide same at no additional cost to the Contracting Officer.
- 3.3.6 If the Contractor requests any deviation from the specifications, or makes or causes to be made any changes of construction from specifications, and such requests require the time and investigation of Inspectors, whether employed directly by the Contracting Officer or by consultants selected by the Contracting Officer, all costs incurred by the Contracting Officer relating to such time and investigation shall be paid for by the Contractor on the basis of 2.5 times the costs.

### 3.4 FIELD TESTS OF CONCRETE

- 3.4.1 Field tests of concrete will be made at the job site in accordance with Corpus Christi Army Depot procedures by a certified Laboratory Technician.
- 3.4.2 The Technician will also prepare the specimens and store same at the site for 24 hours in the box furnished by the Laboratory. Specimens shall be protected by the Contractor against damage, until transported to the Laboratory.
- 3.4.3 The minimum number of specimens to be taken daily will conform to ACI 318-83 Par 4.7 Test one cylinder at 7 days and 3 cylinders at 28 days in accordance with ASTM C39.

### 3.5 LOW STRENGTH TESTS OF CONCRETE

- 3.5.1 Strength tests on structural concrete shall be evaluated according to ACI-318-63, Paragraph 4.7.
- 3.5.2 When the average strength of the test cylinders, as defined in ACI-318-83, Paragraph 4.7 falls consistently below the specified strength ( $f'_c$ ), the Contracting Officer shall have the right to order the Contractor to change the proportions of the water content of the concrete, to secure the required strength for the remaining portion of the structure, all at the Contractor's expense. It is the Contractor's complete responsibility to modify the concrete mix design and his material controls or concrete operations where necessary to obtain the compressive strength required by the specification.
- 3.5.3 When the average strength of test cylinders for any portion of the structure is less than that required by the specification or where there is other evidence that the quality of the concrete is below specification requirements, the adequacy of the concrete shall be checked according to the requirements of Corpus Christi Army Depot either by structural analysis, or by core or load tests.
- 3.5.4 Low Strength Tests of Concrete

All expenses borne by the Contracting Officer, resulting from low test procedures specified above, shall be paid for by the Contractor. Pay also for all additional cost for labor and materials required at the job and for all damages resulting from load tests and the taking of cores. The Contractor shall be



## 03000 - Concrete

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held responsible for all delays and damages to other Contractors that occur as the result of non-conformance.

3.6 CONCRETE FINISH SHALL COMPLY WITH ACI 301.

3.6.1 Float Finish shall be applied to monolithic slab surfaces receiving trowel finish or slab surfaces to be covered with membrane or elastic waterproofing.

3.6.2 Trowel Finish: Power-driven troweling or hand troweling shall be applied to monolithic slab surfaces to be exposed to view and slab surfaces covered with resilient flooring.

3.6.3 Broom Finish shall be applied to exterior concrete platforms, stairs, ramps, etc.

3.6.4 Rough Slab Finish: Slabs shall be screeded with straight edges so that no coarse aggregate is visible and slab is suitable to receive fill and mortar setting beds.

END OF SECTION 03300



## 03000 - Concrete

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### SECTION 03305 CONCRETE CURING

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for concrete curing. Products shall match be as directed by the Contracting Officer. Use shall be in accordance with the product manufacturer's recommendations.
- 2.0 PRODUCTS:
- 2.1 Impervious Sheet Materials: ASTM C 171.
- 2.2 Burlap:
- 2.3 Curing Compound: ASTM C 309, Type I, colorless.
- 3.0 EXECUTION: Concrete shall be cured by protection against loss of moisture and rapid temperature change for a period of not less than 7 days for normal concrete or 3 days for high early strength concrete in accordance with ACI 301 procedures.
- 3.1 Absorptive Cover shall be placed to provide coverage of concrete surfaces and edges, with 4-inch lap over adjacent absorptive covers.
- 3.2 Horizontal Surfaces shall be cured by ponding, by covering with a 2-inch minimum thickness of continuously saturated sand, or by covering with polyethylene sheet, saturated burlap, or waterproof paper.
- 3.3 Formed Surfaces shall be cured by moist curing with forms in place for full curing period. Wooden forms shall be kept wet at all times during curing.
- 3.4 Unformed Surfaces, such as slabs and other flat surfaces, shall be cured by application of appropriate curing compound.
- 3.5 Curing Compound shall not be applied where a protective coat or waterproofing is to be expected.

END OF SECTION 03305



## SECTION 03320

### CONCRETE TOPPING

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of concrete floor topping. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
  - 2.1 Cement: Portland cement, ASTM C 150, Type I.
  - 2.2 Sand: ASTM C 33.
  - 2.3 Coarse Aggregate: ASTM C 33, maximum size 3/8 inch.
  - 2.4 Granolithic Material: Emery, hard mineral, or non-staining metallic material finely ground to produce non-skid surface.
  - 2.5 Integral Topping: Topping shall be a one part cement, one part sand, and two parts aggregate mix to produce a hard topping with a minimum 28-day compressive strength of 5,000 psi.
- 3.0 EXECUTION:
  - 3.1.1 Surface of Base Slab shall be roughened before placing topping.
  - 3.1.2 Spread Topping Mixture evenly over base, bring to required depth, and strike off level with a straightedge. Consolidate surface by power-float finishing.
  - 3.1.3 Hard-Trowel-Finish slab topping.
  - 3.1.4 Control Joints in Topping shall be located directly above joints in base slab.
  - 3.2 Granolithic Finish: Topping shall be a one part cement, one part sand, and 1-1/2 parts aggregate mix. Topping shall be placed same as integral topping.
    - 3.2.1 Prior to Final Troweling, granolithic material shall be spread evenly over the topping surface.
    - 3.2.2 Granolithic material shall be worked into the surface to provide complete bonding with the topping and to provide an abrasion-resistant, non-skid surface.

END OF SECTION 03320





## 03000 - Concrete

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### SECTION 03351

#### EXPOSED AGGREGATE CONCRETE

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of exposed aggregate finish on concrete. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
  - 2.1 Cement: ASTM 150, Type I.
  - 2.2 Admixtures: ASTM C 494, ASTM C 260.
  - 2.3 Aggregate: ASTM C 33.
  - 2.4 Water: Clean, potable.
  - 2.5 Cleaning Agent: Commercial grade muriatic acid, mixed 1 part acid to 10 parts water.
  - 2.6 Bonding Agent: Polyvinyl acetate emulsion.
  - 2.7 Surface Aggregate: As directed.
- 3.0 EXECUTION:
  - 3.1 Concrete Shall be Placed and Vibrated to ensure that concrete is consolidated and that all voids are filled.
  - 3.2 Formed Concrete:
    - 3.2.1 Leave forms in place until removal can be effected without damage to the shape or strength of the concrete but, in no case, less than 24 hours. Longer time periods will be required when lower ambient temperatures are experienced.
    - 3.2.2 Immediately after removal of formwork, remove surface cement paste from around aggregate by either washing with water and scrubbing with a stiff bristle brush, wetting and scrubbing surface with cleaning agent, or sandblasting surface.
    - 3.2.3 Cover concrete and continue curing procedures.
  - 3.3 Slabs:
    - 3.3.1 Allow concrete to cure until slab can be loaded without structural damage but, in no case, less than 24 hours.
    - 3.3.2 Uncover slab and remove surface cement paste from around aggregate, using methods described for the removal of paste from formed concrete.
    - 3.3.3 Cover concrete and continue curing procedures.



## 03000 - Concrete

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- 3.4      Exposure: Do not expose more than 40 percent of aggregate surface.
- 3.5      Surface-Applied Aggregate:
  - 3.5.1    Evenly distribute the aggregate on the prepared concrete surface.
  - 3.5.2    Work aggregate into surface to form permanent bond.
  - 3.5.3    Provide proper curing conditions for exposed aggregate surface.

END OF SECTION 03351



## SECTION 03352

### RUSTICATED CONCRETE FINISHES

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of rusticated concrete finishes. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support work.
- 2.0 PRODUCTS:
  - 2.1 Overlaid Plywood: U.S. Product Standard PS-1, B-B High Density Overlaid Concrete Form, Class I.
  - 2.2 Plywood: U.S. Product Standard PS-1, B-B (Concrete Form) Plywood, Class I, Exterior Grade or better, mill-oiled and edge-sealed, with each piece bearing legible inspection mark.
  - 2.3 Chamfer Strips: Metal PVC rubber, or clear white pine with surface against concrete to be planed.
- 3.0 EXECUTION:
  - 3.1 Form Construction: Forms shall be constructed to provide required sizes, shapes, lines, and dimensions and to provide continuous, straight, smooth exposed surfaces. Forms shall be fabricated for easy removal without hammering or prying against concrete surfaces. The number of joints shall be minimized. Joints shall be made watertight to prevent leakage of cement paste. Provisions shall be made for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, inserts, and other features required in the work.
  - 3.2 Form Coatings: Forms shall be oiled with form-coating compounds that will not bond with, stain, or adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces.
  - 3.3 Finish: Fins and other projections shall be completely removed and smoothed. A smooth rubbed finish shall be provided not less than one day after form removal.



## SECTION 03353

### SOLID BOARD CONCRETE FINISHES

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of solid board concrete finishes. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
  - 2.1 Overlaid Plywood: U.S. Product Standard PS-I, B-B High Density Overlaid Concrete Form, Class I.
  - 2.2 Plywood: U.S. Product Standard PS-I, B-B (Concrete Form) Plywood, Class I, Exterior Grade or better, mill-oiled and edge-sealed, with each piece bearing legible inspection mark.
  - 2.3 Fiberboard: Tempered, waterproof, screenback, concrete form hardboard.
- 3.0 EXECUTION:
  - 3.1 Form Construction: Forms shall be constructed to provide required sizes, shapes, lines, and dimensions and to provide continuous, straight, smooth, exposed surfaces. The number of joints shall be minimized. Joints shall be made watertight to prevent leakage of cement paste.
  - 3.2 Form Coatings: Forms shall be oiled with form-coating compounds that will not bond with, stain, or adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces.
  - 3.3 Finish: Fins and other projections shall be completely removed and smoothed. A smooth rubbed finish shall be provided not later than one day after form removal.

END OF SECTION 03352



## 03000 - Concrete

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### SECTION 03354

#### FLEXURAL CONCRETE

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of flexural concrete. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Cement: ASTM C 150, Type I.
- 2.2 Fine and Coarse Aggregates: ASTM C 33.
- 2.3 Admixtures:
- 2.3.1 Air-Entraining Agents: ASTM C 260.
- 2.3.2 Retarders: ASTM C 494.
- 2.3.3 Pozzolans: ASTM C 618.
- 2.4 Mixture Proportions: The concrete shall possess the required 28-day flexural strength and shall be cured and tested in accordance with ASTM C 192 and ASTM C 293.
- 3.0 EXECUTION:
- 3.1 Placing: Concrete shall be deposited in the forms or in front of slip-form pavers within 45 minutes from the time all ingredients are charged into the mixing drum. Concrete shall be deposited as close as possible to its final position. The placement of the concrete shall be continuous and at a uniform rate without unscheduled stops. Concrete shall be consolidated with mechanical vibrating equipment immediately after spreading.
- 3.2 Finishing Operations shall be started immediately after placement of the concrete. Finishing shall be by the machine method except that, where directed, the hand method will be permitted on odd slab widths or shapes and in event of breakdown of the mechanical equipment to finish concrete. The sequence of operations shall be as follows: finishing, floating, straightedging, texturing or troweling, and, where directed, edging of joints.
- 3.3 Curing: Concrete shall be protected against loss of moisture and rapid temperature changes for at least 7 days from the beginning of the curing operation. Unhardened concrete shall be protected from rain and flowing water. Protection shall be provided as necessary to prevent cracking due to temperature changes during the curing period.

END OF SECTION 03354



## SECTION 03362

### PUMPED CONCRETE

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of pumped concrete. Products shall be as directed by the Contracting Officer. Demolition and removal of materials shall be as required to support the work.
  - 2.0 PRODUCTS:
    - 2.1 Concrete Pumps: shall pump a minimum of 100 cubic yards of concrete per hour.
      - 2.1.1 Piston Type: Pump shall draw alternately from a hopper into the discharge pipe by a piston, operated mechanically or hydraulically.
      - 2.1.2 Pneumatic Type: Air pressure shall force the concrete into the discharge pipe.
      - 2.1.3 "Squeeze" Type: Pump-power rollers shall deform a concrete-filled flexible tube to push the concrete into the discharge pipe.
    - 2.2 Discharge Lines:
      - a. 3- to 6- inch steel pipe.
      - b. 5- inch aluminum pipe with acceptable coating.
      - c. 4- to 5- inch rubber hose.
    - 2.3 Hopper: 15 to 20 cu ft. concrete capacity.
  - 3.0 EXECUTION:
    - 3.1 Slump loss shall be less than one inch while passing through the pumping system.
    - 3.2 When concrete must be pumped long distance, a relay system shall be installed (one pump feeds into the hopper of another pump).
    - 3.3 Placing concrete by pumping methods shall comply with ACI 304.2R.
- END OF SECTION 03362



## 03000 - Concrete

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### SECTION 03363

#### SECOND-POUR CONCRETE

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of second-pour concrete. Products shall be as directed by the Contracting Officer. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS: Second-pour concrete shall match the materials and mix used for first-pour concrete. Use of second-pour concrete shall be in pre-planned situations in which a small section of the first pour must be interrupted for purposes of expediting construction. Alternating-section pours of large slabs or walls shall not be considered first- or second-pour concrete. Second-pour concrete planning is subject to approval by the Contracting Officer.
- 3.0 EXECUTION:
  - 3.1 Preparation:
    - 3.1.1 All bulkheads and keyways used as limits of the first pour shall be removed and contact surfaces prepared to receive the second-pour concrete.
    - 3.1.2 All forms, reinforcing, and embedments installed for the first pour that will be utilized in the second-pour shall be cleaned and prepared forms applied with approved type of form oil; embedded items that will become integral part of concrete shall be painted with 40/60 (volume) cement-water emulsion.
  - 3.2 Erection:
    - 3.2.1 All additional forms, reinforcing, and embedments required for the second-pour concrete shall be installed.
    - 3.2.2 The second-pour concrete shall be placed in the manner specified for the first-pour concrete.
    - 3.2.3 The curing procedures used for the first-pour concrete shall be used for the second-pour concrete unless otherwise directed or approved by the Contracting Officer.

END OF SECTION 03363



## SECTION 03414

### MISCELLANEOUS PRECAST ITEMS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of miscellaneous precast items. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
  - 2.1 Precast Items shall include, but not be limited to, stairs, planters, handrails, and bumper curbs and shall be supplied by a manufacturer normally engaged in the fabrication of these items.
  - 2.2 Fabrication: PCI MNL-II7.
  - 2.3 Each Unit shall be complete and self-contained.
  - 2.4 Items shall be fabricated from concrete with a minimum 28-day strength of 3,000 psi and shall be reinforced as required to withstand both construction loads and design loads.
  - 2.5 Stairs shall be supplied in complete runs.
- 3.0 EXECUTION:
  - 3.1 Preparation:
    - 3.1.1 Provide Anchors, Devices, and Openings required to install precast units.
    - 3.1.2 Precast Units shall be hoisted at points provided by the manufacturer and in manner that avoids damage to the units.
    - 3.1.3 Temporarily Brace Precast Units in proper position and alignment until permanent anchorage and supports are in place.
  - 3.2 Erection:
    - 3.2.1 Anchor Units in final position by bolting, welding, grouting, or as otherwise directed. Remove temporary shims, wedges, and spacers as soon as possible after anchoring is completed.
      - 3.2.1.1 At Bolted Connections use lock washers or other acceptable means to prevent loosening of nuts. Last thread on an exposed bolt shall be offset.
      - 3.2.1.2 At welded connections, apply rust-inhibitive coating on damaged areas, identical to shop-applied material. Use galvanizing repair coating on galvanized surfaces. Welding shall conform to AWS requirements.
    - 3.2.2 Cleaning: Clean exposed facings to remove dirt and stains that may be on units after erection and completion of joint treatments. Do not use cleaning materials or processes that could change the character of exposed concrete finishes.





## 03000 - Concrete

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END OF SECTION 03414



## SECTION 03510

### GYPSUM CONCRETE DECKS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of gypsum concrete decks. Products shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
  - 2.1 Gypsum Concrete: ASTM C 317, Class A.
  - 2.2 Formboards:
    - 2.2.1 Sheetrock: ASTM C 318.
    - 2.2.2 Mineral Fiber Board: ASTM C612.
    - 2.2.3 Glass Fiber Board: Lightweight, rigid, composed of pressed glass fibers.
  - 2.3 Bulb Tees: ASTM A 499, Grade 50.
  - 2.4 Reinforcing Mesh:
    - 2.4.1 Welded Wire Fabric: ASTM A 185, galvanized, 12 x 48-W0.5 x W0.5.
    - 2.4.2 Woven Wire Fabric: ASTM A 82, galvanized, 19 gauge wire, 2-inch hexagonal mesh.
- 3.0 EXECUTION:
  - 3.1 Support System: Sub-purlins shall be spaced to support formboards and rigidly attached to main supports. Formboards shall fit snugly at sub-purlins and at wall, curbs, and openings.
  - 3.2 Reinforcement: Lay wire fabric continuously over sub-purlins. Do not lap side of reinforcement.
  - 3.3 Gypsum Concrete: Gypsum concrete shall be placed continuously without interruption until entire panel or section is complete. Immediately after placement, screed, level, and trowel smooth.

END OF SECTION 03510



## 03000 - Concrete

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### SECTION 03520

#### INSULATING CONCRETE ROOF DECKS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of insulating concrete roof decks. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
- 2.1 Portland Cement: ASTM C 150, Type I.
- 2.2 Aggregate: ASTM C 332, Type I, perlite or vermiculite.
- 2.3 Water: Clean, potable.
- 2.4 Admixture: Air-entraining, ASTM C 260.
- 2.5 Reinforcement: Welded wire fabric, ASTM A 185, galvanized, 12 x 48 - W 0.5 x W 0.5.
- 3.0 EXECUTION:
- 3.1 Reinforcing Mesh: Place reinforcing mesh with long dimensions at right angles to structural supports, with end laps at least 6 inches and no side laps. Cut to fit around roof openings and projections. Terminate mesh at control joints.
- 3.2 Place Insulating Concrete using equipment and procedures to avoid segregation of mix and loss of air content. Deposit and screed in a continuous operation until an entire panel or section of roof area is completed. Do not vibrate or work mix except for screeding or floating. Leave top surface in acceptable condition to receive subsequent roofing application.
- 3.3 Begin Curing Operations immediately after placement, and air cure for not less than 3 days.

END OF SECTION 03520



## SECTION 03521

### PRECAST LIGHTWEIGHT ROOF SLABS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of precast lightweight roof deck concrete channels, concrete planks, and gypsum planks. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
  - 2.1 Channel Slabs: Slabs shall be composed of Portland cement and lightweight aggregate with minimum compressive strength 3,750 psi. Legs shall be reinforced with deformed bars; web shall have welded wire fabric reinforcement. Channels shall support a 30 psf live load plus a 20 psf superimposed dead load.
  - 2.2 Concrete Planks: Planks shall be composed of Portland cement and lightweight aggregate with a minimum compressive strength of 3,750 psi. Planks shall be reinforced with welded wire fabric. Planks shall support a 30 psf live load plus a 20 psf superimposed dead load.
  - 2.3 Gypsum Planks shall conform to ASTM C 956, factory-laminated to 2-inch thickness, 2-foot wide panels. Planks shall be continuously supported along sides.
  - 2.4 Subpurlins shall be bulb-ties, ASTM A 440.
  - 2.5 Grout shall be lightweight concrete or gypsum concrete.
- 3.0 EXECUTION:
  - 3.1 Concrete Channels and Planks shall be securely attached to support steel or concrete by metal clips or other approved attachments; minimum support bearing shall be 4 inches. Open joints between channels or planks shall be filled with lightweight concrete grout. Planks with tongue and groove edges may not require grouting.
  - 3.2 Gypsum Planks shall be snugly fit between bulb-tee subpurlins. Subpurlins shall be tack-welded or screw-attached to supporting steel or weld bar cast in supporting concrete. Joints at bulb-tees shall be grouted with gypsum grout.

END OF SECTION 03521



## SECTION 03530

### CEMENTITIOUS WOOD FIBER ROOF DECK SYSTEMS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of cementitious wood fiberplanks and tees for roof decks. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Cementitious Wood Fiber Planks shall be precast units composed of extra long wood fiber pressure bonded with Portland cement. Plank edges shall be either tongue and groove or rabbeted to receive bulb-tee subpurlins.
- 2.2 Bulb-Tees: ASTM A 440.
- 2.3 Grout: Lightweight concrete.
- 3.0 EXECUTION:
- 3.1 Subpurlin System: Planks shall be fitted between bulb-tees. Bulb-tees shall be securely fastened to supporting members. Spaces between planks at subpurlins shall be filled with lightweight concrete grout. Systems of planks and subpurlins shall support a 30 psf live load and a 10 psf superimposed dead load.
- 3.2 Tongue and Groove System: Planks shall be erected directly on supporting members and securely attached with metal clips or other approved fasteners. The tongue and groove of both ends and sides of plank shall be snugly fitted to eliminate open cracks.

END OF SECTION 03530



## SECTION 03600

### GROUT

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of grout for bases and joints. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
  - 2.1 Premixed Grout shall contain cement, sand, and admixtures to produce a non-shrinking grout with the addition of potable water. Expansion shall be limited to 0.10 percent at 28 days. (CRD spec reference or ASTM reference)
  - 2.1.1 Metallic Grout shall be non-rusting, containing finely graded metallic aggregate with a compressive strength of 12,000 psi at 28 days.
  - 2.1.2 Non-Metallic Grout shall have a compressive strength of 13,000 psi at 28 days.
  - 2.1.3 Fluid Grout shall be a non-metallic grout with flowable consistency.
  - 2.2 Field-Mixed Grout: Grout shall contain 1 part cement to 3 parts sand by volume, with the water content such that a mass of mortar tightly squeezed in the hand will retain its shape but will crumble when disturbed.

END OF SECTION 03600



## SECTION 03700

### CONCRETE RESTORATION AND CLEANING

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of concrete. Products shall match existing materials and shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
  - 2.1 Epoxy Resin: Two-part epoxy adhesive containing 100 percent solids.
    - 2.1.1 Bond Strength: ASTM C 882; 2,700 psi.
    - 2.1.2 Tensile Strength: ASTM C 638; 6,600 psi.
    - 2.1.3 Elongation: ASTM C 638; two percent.
    - 2.1.4 Flexural Strength: ASTM D 790; 8,000 psi.
    - 2.1.5 Compressive Strength: ASTM D 695; 10,000 psi.
  - 2.2 Bonding Agent: Polyvinyl acetate emulsion, water-resistant when applied and cured.
  - 2.3 Concrete:
    - 2.3.1 Portland Cement: ASTM C 150, Type I.
    - 2.3.2 Sand: ASTM C 33.
    - 2.3.3 Coarse Aggregate: ASTM C 33.
    - 2.3.4 Water: Clean and potable.
    - 2.3.5 Air-Entraining Admixture: ASTM C 260.
    - 2.3.6 Water-Reducing and Retarding Admixture: ASTM C 494.
  - 2.4 Cleaning Agent: Commercial muriatic acid, mixed one part to ten parts potable water.
  - 2.5 Reinforcing Steel: ASTM A 615, Grade 60.
- 3.0 EXECUTION:
  - 3.1 Cleaning:
    - 3.1.1 Clean Concrete Surfaces of dirt, laitance, corrosion, oil, stains, or other contamination. Surface cleaning shall be accomplished by one or more of the following methods as appropriate for the contamination: wire brush using plain water or acid, sandblasting, high pressure steam cleaning with or without chemical additives, high pressure water, high pressure air, or scrub brush and detergent.



When acids or chemicals are used, surface shall be thoroughly rinsed and neutralized. Care shall be taken where sandblasting to not etch the surface.

### 3.1.2 Deteriorated or Spalled Concrete:

#### 3.1.2.1 Completely Remove all loose, deteriorated, or unsound concrete down to sound concrete.

3.1.2.2 Where Removal exceeds 1/4 inch or where resurfacing of the entire area is not anticipated, concrete shall be removed to a minimum depth of 2 inches. If cover for reinforcing bars is 2 inches or less, remove concrete to completely expose the reinforcing in the repair area. Remove concrete to a minimum of 1 1/2-inches clear beyond reinforcing. Edges of the repair area shall be cut sharp, perpendicular to the face of the concrete surface, and at least 1 inch deep. Make the perimeter cut with a concrete saw and in a manner to not cut the reinforcing. Clean reinforcing of all rust and scale. Clean repair area of all loose or foreign material using high pressure air or water.

### 3.2 Resurfacing:

3.2.1 Resurfacing for concrete floors shall be with either epoxy coating or cementitious materials.

3.2.1.1 Epoxy resurfacing shall be applied to a clean hard surface to a minimum thickness of 1/8 inch.

3.2.1.2 Cementitious material resurfacing shall be a minimum of 1 inch thick. Mix shall be one part Portland cement, one part sand, and 1-1/2 parts coarse gravel not exceeding 3/8-inch size crushed rock. Apply bonding compound and immediately place new surfacing. Curing shall be by burlap blanket method. Blankets shall be kept thoroughly saturated and in intimate contact with the concrete.

3.2.2 Resurfacing of Columns: Resurfacing of spalled or deteriorated column surfaces shall be with epoxy grout prepared with the addition of sand to epoxy resin to obtain a mix consistency that will not sag when placed in thin layers on vertical surfaces. Trowel finish.

### 3.3 Concrete Rehabilitation:

#### 3.3.1 Concrete patching:

3.3.1.1 Surface shall be prepared as specified for deteriorated concrete cleaning.

3.3.1.2 Any existing reinforcing bars that have a loss of more than 25 percent of their cross section through corrosion shall be replaced. Clean reinforcing bars by sandblasting or wire brushing.

3.3.1.3 Patch with Portland cement concrete if average patch thickness is 2 inches or greater; if less than 2 inches, patch with epoxy grout. Use bonding compound when placing Portland cement concrete patch.

#### 3.3.2 Crack Repair:

3.3.2.1 Epoxy Resin Adhesive Injection: Provide temporary surface seal on crack with entry ports spaced equal to the approximate thickness of the concrete. Inject adhesive into ports under pressure. Continue from port to port until crack is filled, working from bottom to top. Remove temporary seal and clean surface.

3.3.2.2 Epoxy Grout: The crack shall be cut out at the surface in a V-shape that extends to approximately 2 to 3 inches in width. Thoroughly blow out crack with high pressure air and wet with clean water. Completely fill the crack beyond the V-shaped portion with epoxy grout. The mix shall be thin enough





## 03000 - Concrete

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to run freely into the crack for horizontal surfaces. Vertical cracks shall require a stiff mix tamped into place to fill all voids. Trowel finish.

END OF SECTION 03700



## SECTION 03701

### HOT WEATHER CONCRETING

- 1.0 DESCRIPTION OF WORK: This specification covers the special considerations as they relate to admixture usage, concrete temperature and haul time when placing concrete in hot weather.
- 2.0 GENERAL:
- 2.1 When the temperature of the plastic concrete reaches 85° F., an approved retarding admixture shall be used or the approved water reducing admixture in use shall have its dosage increased by 50% over the dosage recommended by the Approved Admixtures list for temperature experienced. This requirement may be waived by the Engineer when fly ash compensated mixtures are used.
- 3.0 PAVEMENT, BASE COURSE, BASE COURSE WIDENING:
- 3.1 Plastic concrete temperatures up to 95° F., as placed, may be permitted provided jobsite conditions permit placement and finishing without excessive use of water on and/or overworking of the surface. The occurrence within 24 hours of unusual surface distress shall cause to revert to a maximum 90° F., plastic concrete temperature.

END OF SECTION 03701

END OF SPECIFICATION SECTION 03 - Concrete



## SECTION 04140

### EPOXY MORTAR

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of epoxy mortar. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance
- 2.0 Products:
  - 2.1 Epoxy Mortar:
    - 2.1.1 Epoxy Adhesive shall be a two-component epoxy consisting of epoxy resin and hardener and complying with the following performance requirements:
      - 2.1.1.1 Tensile Elongation: 2.5 percent minimum per ASTM D 638.
      - 2.1.1.2 Tensile Strength: 3,500 psi minimum per ASTM D 638.
      - 2.1.1.3 Compressive Strength: 6,000 psi minimum per ASTM D 695.
      - 2.1.1.4 Water Absorption (24 hours): 0.5 percent per ASTM D 570.
    - 2.1.2 Stone Filler shall be stone of the same type and color as the stone being patched and shall be ground to approximately the texture of coarse sand.
    - 2.1.3 Pigments shall be of the type that will not react with the epoxy adhesive.
    - 2.1.4 Thickening Powder shall be silicon carbide powder or asbestos powder.



## 04000 - Masonry

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### SECTION 04200

#### UNIT MASONRY

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of facing brick, concrete block, glazed concrete unit masonry, sound-absorbing unit masonry, clay wall tile, sound-absorbing structural glazed tile, glass unit masonry, and vitrified clay flue liners. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
  - 2.1 Concrete Block:
    - 2.1.1 Solid Load-Bearing Concrete Block: ASTM C 145:
    - 2.1.2 Hollow Load-Bearing Concrete Block: ASTM C 90.
    - 2.1.3 Nonload-Bearing Concrete Block: ASTM C 129, Type I.
    - 2.1.4 Patterned Concrete Block: Compatible with existing in dimension and appearance.
  - 2.2 Glazed Concrete Unit Masonry:
    - 2.2.1 Factory-Applied, Pre-Faced, Concrete Masonry units shall be of standard shapes and sizes conforming to ASTM C 90, Grade N or Type 1.
    - 2.2.2 Facing Components shall conform to ASTM C 744.
    - 2.2.3 Unit finish and color shall match existing units as directed by the Contracting Officer.
  - 2.3 Sound-Absorbing Unit Masonry:
    - 2.3.1 Sound-Absorbing Masonry Units shall be of standard shapes and sizes conforming to ASTM C 90 or ASTM C 129, as applicable.
    - 2.3.2 Slots in the Masonry Unit Cavities shall be narrow slots in empty cavities or wide slots with fibrous fillers in cavities, as applicable, for desired sound transmission absorption.
    - 2.3.3 Prefinished Units shall have ground-face, glazed surface or match existing surfaces as directed by the Contracting Officer.
  - 2.4 Wall Tile:
    - 2.4.1 Load-Bearing Wall Tile hollow units shall be of standard shapes and sizes conforming to ASTM C 34, Grade LB or LBX as applicable.
    - 2.4.2 Nonload-Bearing Wall Tile shall be of standard shapes and sizes conforming to ASTM C 56, Grade NB.
    - 2.4.3 Clay Wall Tile Color shall conform to ASTM C 212 or ASTM C 126.



- 2.4.4 Plaster Base Finish shall conform to ASTM C 34 and ASTM C 56.
- 2.4.5 Metal Wall Ties: Shall be 20 ga. chrome steel or 32 oz. cold-rolled copper strips, 3/4" wide and of sufficient length to extend 4" into backing and through full thickness of facing or furring, less 1/2" setback at exposed surfaces. Ends shall be crimped to provide anchorage in mortar joints.
- 2.5 Structural Facing Tile: Grade "G" (Ground Edge), Grade "SS", (Select for stack bond for all other bonds Grade "S", Select. Conform to requirements of Facing Tile Institute and ASTM C 126.
- 2.6 Sound-Absorbing Structural Glazed Tile: Sound-absorbing tile units shall be of standard shapes and sizes conforming to ASTM C 212 or ASTM C 126. The required Sound Transmission Class (STC) shall be in accordance with ASTM E 90.
- 2.7 Glass Unit Masonry:
  - 2.7.1 Glass Block Hollow Units shall be classified for 3/4 hour of fire exposure in accordance with UL Fire Exposure Classification 9 (UL-9) : "Fire Test for Window Assemblies."
  - 2.7.2 Insulation R-Values for the following unit face sizes shall be: 6 inches by 6 inches equals R-2; 8 inches by 8 inches equals R-1.96; and 12 inches by 12 inches equals R-1.92.
  - 2.7.3 Unit Face Pattern shall be of a standard design to provide desired light transmission, brightness, and privacy.
  - 2.7.4 Mortar shall be Type S in accordance with ANSI A4I. and ASTM C 270.
  - 2.7.5 Reinforcement for Glass Blocks: Shall be galvanized wire consisting of No. 9 ga. longitudinal wire 2" o.c. with No. 12 ga. cross wires 8" o.c. welded to the longitudinal wires.
- 2.8 Refractories: Vitrified clay flue lining shall be rectangular, round, or modular, of standard sizes, and shall conform to ASTM C 315.
- 2.9 Mortar Materials and Mixing:
  - 2.9.1 Normal Portland Cement: Shall comply with ASTM C 150, Type 1.
  - 2.9.2 High Early Strength Portland Cement: Shall comply with ASTM C 150, Type III.
  - 2.9.3 Non-Staining Portland Cement: Shall be equal to Atlas white non-staining Portland cement, Trinity white non-staining Portland cement or Medusa white non-staining Portland cement.
  - 2.9.4 Masonry Cement: Shall comply with ASTM C 91, Type II.
  - 2.9.5 Gypsum Neat Plaster: Non-fibered in accordance with ASTM C 28
  - 2.9.6 Water: Shall be clean, free from organic materials, strong acids or alkali, or shall be the water used in the County for drinking.
  - 2.9.7 Sand: Shall consist of small grains of disintegrated rock less than 1/4" in size. Shall be clean, sharp, coarse, durable and siliceous and free from lumps, soft and flaky particles, salt, lime, clay, organic materials and other foreign substances. Shall comply with ASTM C 144.
  - 2.9.8 Aggregate for CMU- 100% lightweight aggregate, expanded clay, shale or slate (Rotarry Kiln Process) No mixture with other aggregates allowed.



## 04000 - Masonry

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- 2.9.9 Lime: Shall be pressure hydrated type in accordance with ASTM C 207, Type S. A statement that the lime is not less than 92 percent hydrated shall appear on the container.
- 2.9 Colors For Mortar: When specified a coloring material shall be mixed with mortar. The coloring material shall be composed of sunfast. It shall be uniform in shade and quality and free from acids, moisture and adulterants. The fineness shall be equal to Portland cement and the coloring matter shall be not more than 10 percent by weight of the cement used. Sufficient quantities of the coloring matter shall be used to match approved sample or adjoining work, as specified in Schedule, in accordance with manufacturer's printed recommendations.
- 2.10 Masonry Accessories:
- 2.10.1 Reinforcement Bars for lintels, bond beams, pilasters, and other masonry reinforcement shall comply with ASTM A 615, Grade 40.
- 2.10.2 Joint reinforcement shall be prefabricated from zinc-coated cold drawn steel wire complying with ASTM A 641, Class 2 or 3 coating. Side wires shall be 8-gauge deformed wire; truss rods shall be 9-gauge smooth or deformed wire.
- 2.10.3 Wire-Mesh Ties shall be 16-gauge or larger diameter, zinc-coated steel wire woven into 1/2 inch mesh and cut into strips 1 inch narrower than the width of walls in which they are used. Zinc-coated wire shall comply with ASTM A 641, Class 2 or 3 coating.
- 2.10.4 Rigid Steel Anchors shall be a minimum of 1 inch x 1/4 inch x 26 inches long with each end turned up not less than 2 inches. Anchors shall be zinc-coated complying with ASTM A 123.
- 2.10.5 Seals and Gaskets for Control and Expansion Joint shall be of closed cell natural or synthetic rubber.
- 2.11 Manufacturers:
- 2.11.1 Aggregate for CMU: Northeast Solite Corporation, Mt. Marion, N.Y. 12456
- 2.11.2 Structural Facing Tile: Stark Ceramics, Inc., Canton, Ohio 44711
- 2.11.3 Acoustic Units (Sound Absorptive CMU): Proudfoot Company, Inc., Greenwich, Ct.
- 2.11.4 Reinforcement and Ties: Hohmann and Barnard, Inc., Hauppauge, N.Y.
- 2.11.5 Insulation: Dow Chemical Co., Midland, Michigan.

END OF SECTION 04200



## SECTION 04205

### SCAFFOLDING - TUBULAR STEEL

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of tubular steel scaffolding. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

Tubular steel or aluminum scaffolding system shall comply with OSHA Safety and Health Standards, Section 29 CFR, 1926/1910.

3.0 EXECUTION (Section not used.)

END OF SECTION 04205



## SECTION 04210

### BRICKWORK

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of brickwork. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.0.1 Common Brick: Shall be sound, hard, wall burned clay brick, homogeneous in structure and free from cracks, lamination planes, voids, and other defects that will impair strength and durability. Shall comply with ASTM C 62, Grade SW for exterior walls below grade, Grade MW for exterior walls above grade and Grade NW elsewhere.
- 2.0.2 Face Brick: Shall comply with ASTM C 216, Grade as required, Type FBX, and all other requirements specified for common brick. In addition face brick shall be uniform in color and texture and free from blisters, chips and other defects that will mar appearance. Unless otherwise specified in the Schedule face brick shall be a practical match of existing face brick at the site. Submit samples as specified in the Schedule.
- 2.0.3 Enameled Brick: Shall be first quality enamel brick with a hard and durable enamel surface that will not peel or discolor and will not be affected by concentrated acids. Color, face dimensions and thickness as required.
- 2.0.4 Glazed Brick Units shall conform to ASTM C 216, Grade S and of size and color as required.
- 2.0.5 Salt Glazed Brick: Shall be first quality salt glazed brick with a salt glaze surface that will not scale or peel. Color, face dimensions and thickness as specified.
- 2.0.6 Fire Brick: Shall comply with ASTM C 27 for Low Heat Duty Fire Brick.
- 2.0.7 Fire Clay: Shall consist of refractory clay or mixtures of quality equal to that used in manufacture of fire brick.
- 2.4 Mortar Materials and Mixing:
- 2.4.1 Normal Portland Cement: Shall comply with ASTM C 150, Type I.
- 2.4.2 High Early Strength Portland Cement: Shall comply with ASTM C 150, Type III.
- 2.4.3 Non-Staining Portland Cement: Shall be equal to Atlas white non-staining Portland cement, Trinity white non-staining Portland cement or Medusa white non-staining Portland cement.
- 2.4.4 Masonry Cement: Shall comply with ASTM C 91, Type II.
- 2.4.5 Gypsum Neat Plaster: Non-fibered in accordance with ASTM C 28.





- 2.4.6 Water: Shall be clean, free from organic materials, strong acids or alkali, or shall be the water used in the Corpus Christi Army Depot for drinking.
- 2.4.7 Sand: Shall consist of small grains of disintegrated rock less than 1/4" in size. Shall be clean, sharp, coarse, durable and siliceous and free from lumps, soft and flaky particles, salt, lime, clay, organic materials and other foreign substances. Shall comply with ASTM C 144.
- 2.4.8 Lime: Shall be pressure hydrated type in accordance with ASTM C 207, Type S. A statement that the lime is not less than 92 percent hydrated shall appear on the container.
- 2.5 Manufacturers:
- 2.5.1 Insulation: Dow Chemical Co., Midland, Michigan.
- 2.5.2 Mortar Coloring:
1. "SGS" Mortar Colors, Solomon Grind-Chem Services, Inc.
  2. "True Tone Mortar Colors", Davis Colors, Rockwood Industries, Inc.
- 2.6 Masonry Accessories:
- 2.6.1 Reinforcement Bars for lintels, bond beams, pilasters, and other masonry reinforcement shall comply with ASTM A 615, Grade 40.
- 2.6.2 Joint Reinforcement shall be prefabricated from zinc-coated, cold drawn steel wire complying with ASTM A 641, Class 2 or 3 coating. Side wires shall be 8-gauge deformed wire; truss rods shall be 9-gauge smooth or deformed wire.
- 2.6.3 Wire-Mesh Ties shall be 16-gauge or larger diameter, zinc-coated steel wire woven into 1/2 inch mesh and cut into strips 1 inch narrower than the width of walls in which they are used. Zinc-coated wire shall comply with ASTM A 641, Class 2 or 3 coating.
- 2.6.4 Rigid Steel Anchors shall be a minimum of 1 inch x 1/4 inch x 26 inches long with each end turned up not less than 2 inches. Anchors shall be zinc-coated complying with ASTM A 615, Class 2 or 3.
- 2.6.5 Seals and Gaskets for Control and Expansion Joint shall be of closed cell natural or synthetic rubber.
- 2.6.6 Nylon Rope for weep holes shall be 3/8 inch diameter by 12 inches long.
- 2.6.7 Wire Brick Ties shall be fabricated from 3/16-inch diameter zinc-coated steel wire conforming to ASTM A 641, Class 2 or 3 coating. Ties shall be at least 4 inches wide and embedded 4 inches into backup material.
- 2.7 Flashing: Through-Wall Flashing shall be one of the following:
- 2.7.1.1 Five-Ounce Copper Sheet shall comply with ASTM B 370, cold-rolled temper, coated both sides with a factory-applied elastic asphalt compound complying with ASTM D 449.
  - 2.7.1.2 Ten-Ounce Rib-Formed Copper Sheet shall comply with ASTM B 370, cold-rolled temper, with ribs approximately 3/16-inch high and spaced not more than 3 inches apart.
  - 2.7.1.3 Rib-Formed 32 Gauge, Type 302 or 304 Stainless Steel Sheet shall comply with ASTM A 167. Deformations shall be approximately 3/16 inch high and shall be spaced not more than 3 inches apart.
- 2.7.2 Flashing beneath coping stone shall be one of the following:



## 04000 - Masonry

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2.7.2.1 Stainless Steel Sheet shall comply with ASTM B 370, cold-rolled temper, 16-ounce per square foot.

2.7.2.3 Aluminum-Sheet shall comply with ASTM B 209, alloy 3003, temper H-14, .032 inch thick.

END OF SECTION 04210



## SECTION 04251

### TERRA COTTA

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation, of terra cotta. Products shall be directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
  - 2.1 Terra Cotta: Hard-burned, non load-bearing clay building units.
  - 2.2 Material for Setting Terra Cotta:
    - 2.2.1 Cement shall be Portland cement complying with ASTM C 150, Type I or Type IA.
    - 2.2.2 Sand for Mortar shall be tested in compliance with ASTM C 40 and C 117. Sand shall have a fineness modulus between 2.0 and 2.5.
    - 2.2.3 Lime shall comply with ASTM C 5.
    - 2.2.4 Hydrated Lime, if allowed, shall comply with ASTM C 6.
  - 2.3 Mortar for the resetting of terra cotta shall be composed of one part Portland cement, 3-1/2 parts sand, and 1/2 part lime putty by volume.
- 3.0 EXECUTION:
  - 3.1 Restoration of Terra Cotta Surface:
    - 3.1.1 Remove All Loose Chips or flaking pieces from the surface. Cut mortar out of all joints to a depth of 3/8 inch from the face of the terra cotta.
    - 3.1.2 Build Up Voids and Irregularities in the surface using successive coats of an epoxy caulk consisting of a 2-component 100 percent flexible-cured, thixotropic epoxy suitable for vertical surfaces.
    - 3.1.3 Give All patched Surfaces of the terra cotta two coats of an epoxy glaze consisting of 2-component, 100 percent epoxy, high-solids content, flexible cured, interior-exterior, high-gloss glaze.
  - 3.2 Replacement of Terra Cotta:
    - 3.2.1 Terra Cotta Units required to be replaced shall be carefully removed to avoid disturbing adjacent units.
    - 3.2.2 Set Replacement Units plumb, level, true to line, and in a manner to match existing terra cotta.
  - 3.3 Sealing Terra Cotta Joints:
    - 3.3.1 Remove Joint material to a depth of 3/8 inch or to the depth of sound material.
    - 3.3.2 Clean the Joints thoroughly.



## 04000 - Masonry

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3.3.3 RegROUT Joints and tool surface to match appearance of adjacent floor.

END OF SECTION 04251



## SECTION 04400

### STONework

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation, of stonework. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
  - 2.1 Indiana Limestone: ASTM C 568, Category II.
  - 2.2 Marble: ASTM C 503.
  - 2.3 Building Sandstone: Compatible with existing.
  - 2.6 Structural Granite: ASTM C 615.
  - 2.5 Masonry Accessories:
    - 2.5.1 Fastenings for Stone: Furnish and install all anchors, dowels, clamps, clips, bolts, and other attachments necessary to fasten and anchor stone in place. Steel wire shall be zinc-coated in compliance with ASTM Specification A 641 for Class 2 coating. Stainless steel shall be used to fabricate the sizes, shapes, and types of all anchoring and fastenings, except wire.
    - 2.5.2 Slots for Dovetail Anchors shall be of 24-gauge commercial galvanized sheet metal, formed to give double anchorage for shoulder to forms.
    - 2.5.3 Dovetail Anchors for fastening masonry to concrete shall be compatible with anchor slots.
  - 2.6 Epoxy Mortar Patching Materials:
    - 2.6.1 Epoxy Adhesive shall be a two-component epoxy consisting of epoxy resin and hardener and complying with the following performance requirements:
      - 2.6.1.1 Tensile Elongation: 2.5 percent minimum per ASTM D 638.
      - 2.6.1.2 Tensile Strength: 3,500 psi minimum per ASTM D 638.
      - 2.6.1.3 Compressive Strength: 6,000 psi minimum per ASTM D 695.
      - 2.6.1.4 Water Absorption (24 hours): 0.5 percent per ASTM D 570.
    - 2.6.2 Stone Filler shall be stone of the same type and color as the stone being patched and shall be ground to approximately the texture of coarse sand.
    - 2.6.3 Pigments shall be of the type that will not react with the epoxy adhesive.
    - 2.6.4 Thickening Powder shall be silicon carbide powder or asbestos powder.
- 3.0 EXECUTION:



## 04000 - Masonry

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### 3.1 Preparation:

3.1.1 Removal of Deteriorated Material: Chip out all deteriorated stone in areas to be patched to sound material. Square cut or undercut edges to a minimum 1-inch depth to form a key for patching material.

3.1.2 Cleaning: Clean area to be patched and dry thoroughly.

### 3.2 Installation:

#### 3.2.1 Patching Stone:

3.2.1.1 Within 30 minutes after mixing epoxy adhesive, apply mortar to the area to be patched. Build up mortar beyond the adjacent surface to allow grinding to match existing surface textures.

3.2.1.2 Allow patching mortar to cure for a minimum of 24 hours before grinding or chiseling.

#### 3.2.2 Replacing Stone:

3.2.2.1 Cut Replacement Stone accurately to shape and dimensions and joints and bonding as required.

3.2.2.2 Exterior Sill Stones, Panels, Copings, Cornice, and Similar Stones with exposed top surfaces shall be cut to set on their natural beds and shall have a wash on the top surface.

#### 3.2.3 Setting Stone:

3.2.3.1 Where stone is backed up with concrete or concrete blocks, coat the face of the backup material with an approved non-staining asphalt complying with ASTM D 449, Type D.

3.2.3.2 Provide expansion or control joints in stonework as required.

3.2.3.3 Install pressure sensitive polyethylene tape or aluminum foil bond breaker, prime edges of stone, and fill remainder of joint with caulking and sealing compound.

#### 3.2.4 Pointing and Cleaning:

3.2.4.1 Upon completion, all joints shall be carefully pointed.

3.2.4.2 Clean stone surfaces using fiber brushes and trisodium phosphate solution.

END OF SECTION 04400



## SECTION 04500

## MASONRY RESTORATION

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation, of materials for general masonry restoration. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Abrasive Blasting Material shall be a combination of friable, finely graded, clean particles, containing approximately 97.8 percent silicates and other minerals by weight. The material shall contain no free silica nor any crushed or quarried sand.

2.1.1 Sieve analysis for wet blasting aggregate shall be:

<u>Sieve Mesh</u>	<u>Percent Retained</u>	
	<u>Min</u>	<u>Max.</u>
28	5	15
35	22	32
48	73	90

2.1.2 Aggregate for Dry Blasting: The size of aggregate for dry blasting shall be determined by careful material analysis for the given application.

2.2 Mortar Materials:

2.2.1 Hydrated Lime: AS7M C 207, Type S or N of Fed. Spec. 55-L-351.

2.2.2 Cement:

2.2.2.1 Portland Cement: ASTM C 150, Type I or II.

2.2.2.2 Masonry Cement: ASTM C 91.

2.2.2.3 Cement shall not have more than 0.60 percent alkali (sodium oxide) nor more than 0.15 percent water soluble alkali in the combination of lime and cement.

2.2.3 Aggregate:

2.2.3.1 Coarse Aggregate: ASTM C 404 and not containing any substance that will stain the masonry.

2.2.3.2 Sand for Use with Masonry: ASTM C 144. Sand shall not contain any substance that will stain masonry.

2.2.3.3 Sand for Use with Stone: ASTM C 33.

2.2.4 Admixtures: Fed. Spec. SS-C-1960/1 consisting of water-repellent stearates and pozzolanic plasticizers in powder form. Salt, anti-freeze liquid, accelerator, or other admixtures shall not be used.



## 04000 - Masonry

- 2.2.5 Colored Masonry Cement: Mortar colors shall be high purity, chemically inert, color-fast, and alkali-proof mineral oxides. Color shall not exceed 10 percent of the cement weight; carbon black shall not exceed 3 percent of the cement weight.
- 2.2.6 Water shall be clean, fresh, and free from injurious amounts of oil, acid, salt, alkali, organic matter, or other deleterious substances.
- 2.2.7 Mortar Proportions shall be as follows:
- | Portland<br>Cement | Hydrated<br>Lime | Sand |
|--------------------|------------------|------|
| 1                  | 1                | 6    |
- Add pigments if required.
- 2.3 Grout: Grout shall be flexible, non-shrink, non-staining grout specifically formulated for use in masking and grouting.
- 2.4 Masking Material shall be a special masking tape, compatible with the grout technique.
- 2.5 Expansion Joint Filler: Half-inch thick expansion joint stripe such as "Insulux," as manufactured by Owens-Illinois Glass Company, or pre-molded cork No. 591, or pre-molded fiber glass, as manufactured by Pittsburg Corning Corp., or other approved equal.
- 2.6 Calking Compound: Shall be a factory-mixed calking compound with a butyl rubber base. The compound shall have the following minimum test values when tested in accordance with test procedures of Fed. Spec. TT-P-781:
- |                                      |                              |
|--------------------------------------|------------------------------|
| Tensils adhesiveness,                | 126                          |
| Shearing adhesiveness,               | 18                           |
| Worked consistency                   | 223                          |
| Penetration of dried compound        | 120                          |
| Appearance of dried compound         | no cracking                  |
| Sag or slump                         | none                         |
| Total volatile matter, %             | 0.3                          |
| Total solids, %                      | 99.7                         |
| Penetration after 300 hrs. exposure  | 200                          |
| Penetration after 600 hrs. exposure  | 184                          |
| Penetration after 1000 hrs. exposure | 112                          |
| Penetration after 1600 hrs, exposure | 103                          |
| Vehicle composition                  | butyl rubber<br>plasticizers |
- Shall be gun grade, used direct from can without admixtures, and applied in accordance with manufacturer's printed installation instructions. Submit literature for approval.
- 2.7 Calking Primer: Shall be waterproof type as a recommended, and will when required, by manufacturer of calking compound.
- 2.8 Bond Preventive Material shall be pressure sensitive polyethylene tape, aluminum foil or wax paper.
- 3.0 EXECUTION:
- 3.1 Preparation:





- 3.1.1 General: Clean masonry surfaces free from efflorescence, mildew, fungus, graffiti, vines, tentacles, and all other blemishes. Wire brushing or sandblasting will not be allowed for paint removal.
- 3.1.2 Deteriorated Material: For repointing, tuck pointing, masking, and grouting, cut out old mortar in brickwork to a minimum depth of 1/2 inch and cut out old mortar in stonework to a minimum depth of 1 inch. Deteriorated material shall be removed to the full depth of mortar disintegration. Following cleaning, blow joints clean to remove all dust, dirt, and remaining loose aggregate.
- 3.2 Masonry Cleaning:
  - 3.2.1 Washing: A specialized aeration type nozzle shall be used to project water at 1,000 to 1,200 psi pressure. Any evidence of masonry material damage or removal shall be cause for immediate work stoppage.
  - 3.2.2 Steam Cleaning: Scrub all surfaces to be cleaned with a mild soap or detergent. Apply steam at a pressure of 10 to 30 psi to thoroughly flush and remove all foreign matter and to neutralize and rinse away all cleaning solutions.
  - 3.2.3 Chemical Cleaning:
    - 3.2.3.1 Acidic Products shall be used only on acid-tolerant materials such as granite, sandstone, and unglazed brick.
    - 3.2.3.2 Alkaline Cleaners shall be used only on acid-sensitive materials such as limestone and marble.
    - 3.2.3.3 Surfactants shall be used only on polished granite or glazed brick.
  - 3.2.4 Abrasive Blasting:
    - 3.2.4.1 Wet Aggregate Blasting shall be performed using a specialized nozzle that combines specified aggregate, clean water and air. Water pressure shall not exceed 150 psi. Air pressure shall not exceed 70 psi. After cleaning, rinse surfaces to remove aggregate and loosened soil.
    - 3.2.4.2 Dry Aggregate Blasting shall be continuous bombardment of the masonry surface with a finely divided aggregate. Air pressure shall be between 20 and 100 psi. After cleaning, rinse surfaces to remove aggregate and loosened soil.
  - 3.2.5 Repointing and Tuckpointing:
    - 3.2.5.1 Pointing of Brickwork: Compact new mortar in deep cuts in successive layers until a uniform joint depth throughout has been attained. After deep joints have been leveled, fill all joints with mortar and pack the back corners of the joint.
    - 3.2.5.2 Pointing of Stonework: Compact new mortar in deep cuts in successive layers until a uniform joint depth throughout has been attained. After deep joints have been leveled, fill joints with a layer of mortar 1/2 inch deep and pack the back corners of the joint. Approximately 1 hour later, apply another layer of mortar completely filling the joint.
    - 3.2.5.3 Tooling: Tool the joint to match the appearance of the adjacent mortar jointer with a round jointer to produce smooth, dense, concave joints.
  - 3.2.6 Masking and Grouting:
    - 3.2.6.1 Masking: Mask the face of each individual masonry unit, keeping the edge of the tape 1/16 inch away from all edges of the masonry unit to allow an overlap of the grouting material onto the masonry.



## 04000 - Masonry

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3.2.6.2 Grouting: Completely fill all joints, cracks, and voids with grout.

3.2.6.3 Cleaning: Keep all exposed masonry clean and free of mortar as work progresses. Clean masonry surfaces using fiber brushes and trisodium phosphate solution. Rinse surfaces with clean water immediately after cleaning.

END OF SECTION 04500

END OF SPECIFICATION SECTION 04 - Masonry



## SECTION 05120

### STRUCTURAL STEEL

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of structural steel. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS :

2.1 Structural Steel:

2.1.1 Carbon Grade Steel: ASTM A 36.

2.1.2 High-Strength Low-Alloy Steel: ASTM A 441.

2.1.3 Corrosion-Resistant High-Strength Low-Alloy Steel: ASTM A 242 or A 588.

2.1.4 Quenched and Tempered Alloy Steel: ASTM A 514.

2.1.5 Structural Tubing: ASTM A 500, Grade B or ASTM A 501.

2.1.6 Steel Pipe: ASTM A 53, Type E or Type S, Grade B.

2.2 Connections:

2.2.1 High-Strength Bolts: ASTM A 325, A449; or A 490, including nuts and washers.

2.2.2 Carbon Steel Bolts: ASTM A 307, Grade A.

2.2.3 Carbon Steel Nuts: ASTM A 563, Grade A, Square or Hex Style.

2.2.4 Plain Washers, Other Than Those in Contact with High-Strength Bolts: ANSI B18.22.1, Type B.

2.2.5 Wall Anchors: Shall be "V" of Governmental Type.

2.2.6 Rivet Steel: shall conform to the Standard Specification of the ASTM A-502, Grade 1 or Grade 2, latest edition.

2.2.7 Welding Materials: Paragraph 301 of the A.W.S. D 1.1, Code for Welding in Building Construction, American Welding Society, shall apply.

Bare electrodes and Granular Flux used in the submerged -arc process shall conform to F60 or F70 AWS-Flux classifications of the Specification for Bare Mild Steel Electrodes and Fluxes for Submerged Arc Welding, AWS A5.7, latest edition, or the provisions of Sect. 1.17.3. E60S or E70S electrodes used in the gas metal-arc process shall conform the Specification for Mild Steel Electrodes for Gas Metal-Arc Welding, AWS A5.18, latest edition, or the provisions of Sect. 1.17.3; E60Tor E70T electrodes used in the flux cored-arc process shall conform to the Specification for Mild Steel Electrodes for Flux-Cored-Arc Welding, AWS A5.20, latest edition, or the provisions of Sect. 1.17.3. sufficient evidence or conformity with the Specifications.



## 05000 - Metals

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- 2.3 Primer: Fed. Spec. TT-P-86, Type I or II; TT-P-615, Type I, or II, V; TT-P-645; or Tnemec number 10-99..
- 2.4 Fabrication: Fabrication shall be in accordance with the applicable provisions of the AISC Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings. Fabrication and assembly shall be done in the shop to the greatest extent possible. Ends shall be square within the tolerances for milled ends specified in ASTM A 6. Structural steelwork, except surfaces to be field welded, friction bolted, spray fireproofed, encased in concrete, receive shear studs, or to be galvanized shall be prepared for painting in accordance with the AISC Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings and primed with the specified paint. Temporarily brace and shore existing work as necessary to prevent deformation, overstress, collapse or other damage.
- 2.5 All exterior lintel angles and clips shall be galvanized per ASTM D 123 and all hardness shall be galvanized per ASTM A 153.
- 3.0 EXECUTION: Erection of structural steel shall be in accordance with the applicable provisions of the AISC Specification for the Design, Fabrication, and Erection of structural steel for Buildings.
- 3.1 Connections: Anchor bolts and other connections between the structural steel and foundations shall be proved and shall be properly located and built into connecting work.
- 3.2 Base Plates and Bearing Plates: Column base plates for columns and bearing plates for beams, girders, and similar members shall be provided. Base plates and bearing plates shall be provided with full bearing after the supported members have been plumbed and properly positioned, but prior to placing superimposed loads. Separate setting plates under column base plates will not be permitted. The area under the plate shall be dry-packed solidly with bedding mortar.
- 3.3 Field Welded Connections: Field welded structural connections shall be completed before load is applied.
- 3.4 Field Priming: After erection, the field bolt heads and nuts, field welds, and any abrasions in the shop coat shall be cleaned and primed with paint of the same quality as that used for the shop coat.

END OF SECTION 05120



## SECTION 05211

### STEEL JOISTS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of steel joists. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
  - 2.1 Open Web Steel Joists: Steel joists shall conform to the SJI-AISC Standard Specifications for Open Web Steel Joists, J or H Series. Joists shall be designed to support the loads given in the Standard Load Table included with the standard open web joist specifications.
  - 2.2 Longspan Steel Joists and Deep Longspan Steel Joists: Steel joists shall conform to the SJI-AISC Standard Specifications for Longspan Steel Joists, LJ or LH Series, and Deep Longspan Steel Joists, DLJ or DLH Series as required. Joists shall be designed to support the loads given in the Standard Load Table included with the standard longspan and deep longspan joist specifications.
  - 2.3 Accessories and Fittings: Accessories and fittings, including end supports and bridging, shall be in accordance with the standard specifications under which the members were designed.
  - 2.4 Shop Painting: Joists and accessories shall be shop-painted with a rust-inhibiting primer paint.
- 3.0 EXECUTION:
  - 3.1 Joists shall be accurately set, and end anchorage shall be compatible with the bearing surface and the expansion requirements. Joist bridging and anchoring shall be secured in place prior to the application of any construction loads. Any temporary loads shall be distributed so that the carrying capacity of any joist is not exceeded. Loads shall not be applied to bridging. Abraded, corroded, and field- welded areas shall be cleaned and touched up with the same type of paint used in the shop painting.

END OF SECTION 05211



## SECTION 05310

### METAL DECK

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.1 Shop Drawings
- 1.1.1 General
- 1.1.1.1 The shop drawings for the metal deck shall be prepared immediately for the supervision of a Licensed Professional Engineer engaged by the manufacturer, who shall be responsible for their approval.
- 1.1.1.2 Shop drawings shall include, but not be limited to the following:
1. Type and gauge of metal deck.
  2. Welding pattern.
  3. Side and end details of metal deck.
  4. Location of all openings and fittings.
  5. Shop finish.
  6. Size, location and spacing of stud shear connectors, where required, for each beam.
  7. Designation of welding electrode to be used.
  8. The registration number, seal, signature and address of the Professional Engineer who prepared or supervised the preparation of the shop drawings.
- 1.1.1.4 Approval shall not be interpreted to relieve the Contractor of responsibility for correctness of dimensions, fit, quantities of materials and strength connections and details.
- 1.2 Not Used
- 1.3 Certifications
- 1.3.1 Immediately after award of the Project, submit to the Contracting Officer an affidavit indicating that an order has been placed with the producer of the metal deck for the entire structural deck requirements for the project.
- 1.3.2 Submit to the Contracting Officer notarized certifications from the manufacturers of the specified materials stating compliance with the applicable requirements set forth for all materials specified in this section.
- 1.4 Not Used
- 1.5 Metal Deck Accessories
- 1.5.1 H.H. Robertson Company.



- 1.5.2 Inland - Ryerson Construction Products Co.
- 1.5.3 Bowman Construction Products, Cyclops Corp., E.G. Smith Division,
- 1.5.4 Or approved equal domestic manufacturer.
- 1.6 Stud Shear Connectors
  - 1.6.1 KSM-Headed Shear Connectors by KSM Products, Inc.
  - 1.6.2 Nelweld Stud Shear Connectors by Nelson Stud Welding Co.,
  - 1.6.3 Or approved equal domestic manufacturer.
- 1.7 Site Storage

Metal Decking shall be stored off the ground with one end elevated to provide drainage and protected from elements with a waterproof covering.
- 1.8 Precautions
  - 1.8.1 Care should be taken to avoid overloading the supporting structural elements when placing bundles of metal deck or other construction loads on floor and roof.
  - 1.8.2 Check all dimensions, levels and condition of beams and notify the Contracting Officer of any discrepancies.
  - 1.8.3 Consult other trades for coordination.
- 2.0 PRODUCTS:
  - 2.1 Deck Unit: Deck material shall be ASTM A 611 Grade C for painted deck and ASTM A 446 Grade A for galvanized deck. Deck units shall conform to the SDI Design Manual for Composite Decks, Form Decks, and Roof Decks, Units shall be fabricated of 18-gauge or thicker steel and shall be galvanized with ASTM A 525,G90 coating class or painted with one coat of manufacturers standard paint. Minimum yield point 33,000 psi.
  - 2.2 Accessories: Metal accessories shall be of the same material as the deck and have minimum gauge as follows: saddles, 18-gauge; welding washer 10-gauge; cant strip 22-gauge; other metal accessories, 20-gauge; unless otherwise indicated.
  - 2.3 Closure Plates: Voids above interior walls shall be closed with 22-gauge sheet metal where directed. Open deck cells at parapets, end walls eaves, and openings through floors and roofs shall be closed with 22-gauge sheet metal. ASTM 525.
  - 2.4 Miscellaneous Steel Shapes: ASTM A36.
  - 2.5 All material, design, fabrication, erection and inspection requirements of metal deck and stud shear connectors shall conform to Corpus Christi Army Depot codes and criteria.
  - 2.6 Reference specifications and Testing Methods
    - 2.6.1 The ASTM Specifications referred to in these specifications are listed below with their serial designation. The latest editions including revisions are declared to be a part of these specifications except where otherwise indicated, the same as if fully set forth elsewhere herein:
      - A36                      Structural Steel



## 05000 - Metals

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A108	Cold Finished Carbon Steel Bars
A446	Zinc-Coated (Galvanized) Steel Sheets of Structural Quality, Coils and Cut Lengths.
A525	Steel Sheet, Zinc-Coated (Galvanized) by the Hot Dip Process, General Requirements.
A611	Steel, Cold-Rolled Sheet, Carbon, Structural.

### 2.6.2 AISC

Specification for Structural Steel Buildings, latest edition.

### 2.6.3 AISI

Specification for the Design of Cold-Formed Steel Structural Members, latest edition.

### 2.6.4 American Welding Society (AWS)

#### 2.6.4.1 Structural Welding Code, AWS D1.1.

#### 2.6.4.2 Specifications for Mild Steel Covered Arc-Welding Electrodes; AWS A5.1.

## 3.0 EXECUTION:

### 3.1 Erection

3.1.1 All units shall be laid in strict accordance with manufacturer's instructions and requirements.

3.1.2 Units shall be adjusted in place before being permanently fastened and shall be accurately aligned end to end. Inaccuracies in alignment or level of bearing shall be rectified before units are finally placed. Shoring of metal deck is not permitted.

3.1.3 Proper bearing shall be provided at all supports.

3.1.4 Deck shall be anchored by welding directly through the bottom of the rib at all structural supports by welds not less than 3/4 inch diameter, spaced not more than 12 inches across the width of the unit. Where two units abut, each unit shall be so fastened to the steel framing. Welds shall be free of sharp points or edges.

3.1.5 Side laps of adjacent units shall be fastened between supports at intervals not exceeding three feet.

3.1.6 Units shall span over three or more supports except where steel layout does not permit. Units shall abut at end joints over beams requiring studs, otherwise, end laps of deck sheets shall be a minimum of 2 inches.

3.1.7 Furnish, install and weld in position, all accessories including closures, and cant strips, where required.

### 3.2 Stud Shear Connector Welding

3.2.1 Studs shall be welded to steel beams directly, or indirectly through the steel deck with automatically-timed stud welding equipment.

3.2.2 Stud welding shall conform to the requirements of AWS with respect to workmanship, quality control and field inspection.

3.2.3 Manufacturer shall supply guidance and instruction in proper installation methods.





- 3.2.4 Additional requirements for stud welding with metal deck:
  - 3.2.4.1 Top flanges of beams, must be free of paint, heavy rust, mill scale, dirt, ice, water, and any other material which will interfere with the welding operation.
  - 3.2.4.2 Metal deck must be free of dirt, ice, water and other foreign materials which will interfere with the welding operation.
  - 3.2.4.3 Metal deck must be placed to bear fully on the surface of beam flanges.
- 3.3 Cutting, Drilling and Reinforcing of Openings
  - 3.3.1 Where predetermined opening (such as stairs and elevators) are framed by structural steel beams on all sides the steel subfloors shall be engineered by the manufacturer to fit these conditions.
  - 3.3.2 Any opening which is not framed by structural steel beams on all sides, and which is required in steel decking, shall be cut by the respective trades requiring it.
  - 3.3.3 Reinforcing of Openings in Steel Deck.
    - 3.3.3.1 Holes 6 inches or less in dimension need not be reinforced.
    - 3.3.3.2 Holes greater than 6 inches but less than 20 inches in any dimension shall be reinforced.
- 3.4 Maintenance

Any scratching or abrasions of the prime coat shall be touched up in the field after installation.

END OF SECTION 05311



## SECTION 05500

### MISCELLANEOUS METALS

- 1.0 DESCRIPTION - This specification covers the furnishing and installation of anchors; anchor bolts; dovetail slot inserts; hangers, etc.; roof door frames; ceiling outlet frames; sill and stool supports; trench covers and frames for screens in pipe trenches; guards for kitchen vent flues; tee saddles; chimney connections; lintels, interior; lintels, exterior; angle bases; smoke pockets; I-beam, channel, angle, T-framing, etc; valve operating platform; fuel oil tank chamber platform ladder, steel hangers, ladder racks, broom and mop racks, steel floor box; miscellaneous.
- 1.1 Product Handling
  - 1.1.1 Before shipment to the job, all finished miscellaneous metal shall be adequately protected for transporting and erecting periods.
  - 1.1.2 Replace damaged items and at no additional cost to the Contracting Officer .
- 1.2 Shop Drawings
  - 1.2.1 Show all locations, markings, quantities, materials, sizes and shapes.
  - 1.2.2 Indicate all methods of connecting, anchoring, fastening, bracing and attaching work of other trades.
  - 1.2.3 Do not fabricate until approval of Shop Drawing by the Contracting Officer.
- 2.0 PRODUCTS
  - 2.1 Anchor Bolts & Anchors
    - 2.1.1 Anchor Bolts and Nuts: ASTM A 307, Hot-dipped galvanized, ASTM A 153.
    - 2.1.2 Flat Washers: Of the same material as bolt.
    - 2.1.3 Expansion Anchors:
      - 2.1.4 Lead shied Type: Fed. Spec. FF-S-325, Group I, Type 1, Class 1
      - 2.1.5 Wedge Type: Fed. Spec. FF-S-325, group II, Type 4, Class 1 or 2.
      - 2.1.6 Self-Drilling Type: Fed. Spec. FF-S-325, group III, Type 1.
  - 2..2 Dovetail Slot Inserts - 16 gauge approved noncorrosive metal
  - 2.3 Roof Door Frames
    - 2.3.1 Steel ASTM A-36; Galvanized, ASTM 386
    - 2.3.2 Gray Iron Castings: ASTM A-48, Class 30
    - 2.3.3 Malleable Iron Castings: ASTM A 47
  - 2.4 Ceiling Outlet Frames



- 2.4.1 Ceiling Outlet frames for air diffusers will be furnished under another contract (Heating & Ventilating)
- 2.4.2 The ceiling outlet frames for all recessed electric fixtures will be furnished under another contract (Electrical).
- 2.5 Sill & Stool Supports
- Frames and Screens in Pipe Trenches
  - Guard for Kitchen Vent Flue
  - Tee-Saddles
  - Lintels Interior & External
  - Angles Bases
  - Smoke Pockets
  - I Beam, Channel, Angle, T-Framing
  - Steel Hangers, Ladder Racks, Broom & Mop Racks
  - Steel Floor box
- The above shall be ASTM A 36 steel or as otherwise directed
- 2.6 Miscellaneous - Metals shall conform to similar requirements of other metals outlined in this section
- 3.0 EXECUTION
- 3.1 Anchors
- 3.1.1 Furnish anchors, hangers, clamps, pipes, bolts, clips, straps, pins, rods, dowels, etc., required for setting of brickwork, cinder or concrete block partitions, marble work, etc.
- 3.1.2 Anchors, etc. shall be made of wrought iron of length and shape required by conditions and details. Furnish special shapes where required. All anchors, unless specified otherwise, shall be dipped in red paint.
- 3.1.3 Furnish to the carpenter at the proper time, all 1-1/2 x 1/16 inch: bent galvanized steel strap anchors of sizes and shapes required, for anchoring and securing wood frames of double hung windows to masonry jambs and to beam haunch or steel lintels. Strap anchors shall be spaced. 12'-0"O.C. maximum.
- 3.2 Dovetail Slot Inserts
- 3.2.1 Locations
- In all concrete surfaces more than 1'-9" high which are to be veneered with masonry.
- 3.2.2 Inserts
- Standard Dovetail type, 16-ga. approved non-corrosive metal.
- 3.2.3 Spacing
- 3.2.3.1 Vertical spacing 24" o Horizontal, continuous at spandrel beams column to column.
- 3.2.3.2 Horizontal slot insert shall form reglet for sprandrel flashing.
- 3.2.3.3 Furnish slot inserts for placement in form work before concrete is placed.
- 3.2.3.4 Furnish ties as required for progress of masonry work.



## 05000 - Metals

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### 3.2.4 Ties

Loose, 10-ga. punched plate, or 3/16 inch wire loops; one every 300 sq. ins. (approximately every 5th course). Ties approved non-corrosive metal.

3.2.5 Furnish "Peerless Wedge" inserts, or approved equal, for spandrel beams for support of steel lintel hot-dipped galvanized angles and at other locations if required. Wedge inserts shall be provided with a 3/4 inch diameter reinforcing bar x 1'-6" minimum length through anchor loop to increase anchorage in concrete. Inserts shall be spaced 2'-6" on centers (maximum) starting six (6) inches from face of masonry opening. Submit three (3) samples for approval.

3.2.6 Furnish 16-gauge galvanized corrugated wall ties for securing furring to exterior brick wall at back of auditorium stage or platform. Wall ties shall be spaced one to each four square feet of wall area.

### 3.2.7 Reinforcing Anchors

3.2.7.1 1 Furnish to mason at proper time for installation non-corrosive metal truss-type reinforcing anchors for all block partitions in Gymnasium, Auditorium and Assembly. (Single and/or double block).

3.2.7.2 2 Anchors are required for every third horizontal joint.

3.2.7.3 3 Anchors shall be: - DUR-O-Wall - or TRUSS-MESH, as manufactured by Hohmann and Barnard.

3.2.7.4 4 Anchors at "control joints" shall be cut 1/2 inch short of each joint edge. ANCHORS SHALL NOT BE CONTINUOUS.

3.2.7.5 5 Furnish to mason continuous truss-mesh reinforcement first two courses over all door openings.

### 3.2.8 Wall Ties

3.2.8.1 Furnish to mason at proper time for installation, non-corrosive metal wall ties for bonding S.F.T. units together and to back-up block.

3.2.8.2 Wall ties shall be "ERAYDO ZINC" ties as manufactured by Hohmann and Barnard or other approved equal.

3.2.8.3 Ties shall be proper length for various wall thickness'.

### 3.3 Hangers, Etc.

Where indicated on the drawings furnish and hang from the beams or floor slabs above, bolts and stud bolts for the support of apparatus. Also provide 3/8 inch diameter bolts, washers and nuts, 3 inches long for securing of wood blocking at proscenium arch if required. Bolts to be set in place before masonry on angle is installed.

### 3.4 Roof Door Frames

Furnish and set angle-iron frames for doors to bulkheads on roofs, with anchor straps to be built into the brickwork.

### 3.5 Ceiling Outlet Frames

3.5.1 Ceiling outlet frames for air diffusers will be furnished under another contract (Heating & Ventilating).

3.5.2 The ceiling outlet frames for all recessed electric fixtures will be furnished under another contract (Electrical).



3.6 Sill and Stool Supports

Where grilles are indicated in sills or stools of windows furnish to the mason at the proper time all continuous angles and tees, angle brackets, anchor straps, etc., required for the support of the sills or stools and the grilles. Also include angles, tees, steel plate, etc. for support of structural facing tile, book tile, and other sills where required by drawings.

3.11 Chimney Connection

3.11.1 Boiler Smoke Breechings

Furnish and set on face of wall at openings in chimney, an angle iron frame with welded corners, with strap anchors built into the brickwork at each opening, of size required for connection of the above smoke breechings.

3.11.2 Hot water smoke pipe and kitchen range exhaust furnish and set framed opening for hot water heater smoke pipe and kitchen range exhaust flue, similar to boiler smoke breechings.

3.12 Lintels (Interior)

3.12.1 Furnish to the mason Contractor at proper time for setting, all loose lintels for all openings and recessed 12" or wider, in walls and partitions, except as noted in Par. 3.12.3, below.

3.12.2 General Locations, Etc.

3.12.2.1 Lintels for support of masonry at partition sash.

3.12.2.2 Lintels for all openings for grilles, convectors, and enclosures in connection with Heating and Ventilating Equipment.

For size and type lintels required for Type "B" convector openings.

3.12.2.3 Lintels for all conditions of openings in walls and partitions where ducts, pipes and other mechanical equipment pass through same.

3.12.2.4 Lintels shall rest 5 inches on wall at each jamb.

3.12.3 Exception

No lintels are required for the support of masonry over door openings except for door openings in brick walls 8 inches or more in thickness.

3.13 Lintels (Exterior)

Furnish to mason all steel lintels in exterior walls not connected (by hangers, clips, bolts, or otherwise) to the structural steel work. Lintels in exterior walls of reinforced concrete framed superstructure, or portion thereof, shall be secured in place by means of wedge inserts in concrete beams.

3.14 Angle Bases

Furnish and install angle iron base at gymnasiums, auditorium platform or stage, and other locations where required. Angle base shall be secured in place with 3/8 inch countersunk screw head expansion or toggle bolts to suit conditions, spaced 4'-0" maximum, on centers.

3.15 Smoke Pockets



## 05000 - Metals

Furnish and erect pockets and steel plate at sides of proscenium opening for guides of auditorium stage curtain and for smoke pockets.

### 3.16 I-Beam, Channel, Angle, T-Framing, Etc.

3.16.1 Furnish and erect all I-beams, channels, angles, T's, bent plates, steel plates, bent angle frames and all other miscellaneous iron work required, except framing forming a part of the structural steel work. Drill all holes required to secure metal, wood and other materials to the framing.

3.16.2 Furnish and erect channel framing and stiffening for low partitions where indicated, also channel framing, hangers, etc., in partition between kitchen and playroom-lunchroom and in lane shower.

3.16.3 Provide steel fillers and plates as required for the securing of door holders.

3.16.4 Furnish all steel plates, straps, stiffeners, ties, etc. complete with bolts, washers, etc., for the exterior wood windows. This material shall be furnished to the mill man in time for its incorporation into his work.

3.16.5 Furnish and install 12 gauge channel and 3" x 3" x 1/4" angle frame where ducts pass through fire zone partitions.

3.16.6 Furnish and install angle lintel of sizes required at openings from O.A.I. chambers. The 10 ga. bent angle frame shall be furnished and installed under another section.

3.16.7 Furnish all necessary steel plates, bolts, etc. required for the support of folding partitions when folding partitions are indicated. All bolts shall be in place before proofing fire.

3.16.8 The 5/8 inch threaded bolts where folding partitions are to be supported from structural steel shall be furnished and welded in place as part of the work of this Section.

For exact number of bolts and their locations, see spacing template furnished by partition manufacturer.

Note: Where folding partitions are supported from concrete above, the threaded bolts will be furnished and installed as part of the work of Section 3C.

3.16.9 Furnish and install the 4" x 4" x 3/8" angle frame secured to hangers furnished and installed under another section 9H, for hoods over ranges and dishwashers in kitchen.

Furnish and install continuous angle supports of sizes required at back of sink cabinets in Kindergarten and Library Work Room.

3.16.10 Furnish all clip angles required for anchoring wood blocking at gravel stops. Clip angles of sizes and spacing indicated shall be secured to concrete with threaded bolts; bolts shall be furnished at proper time for setting in concrete. Clips shall be drilled to receive bolts for anchoring wood blocking in place.

3.16.11 Furnish angle frame and shelf angle support for subway type gratings.

3.16.12 Weather Bars for Wood Sills

Furnish to the carpenter, aluminum 1/8" x 1" bars full length of wood window and louver sills. These bars shall be furnished for all wood window and louver sills.

### 3.17 Valve Operating Platform



## 05000 - Metals

Furnish and install complete in the boiler room the steel stairs and platform. The stairs shall be constructed of steel channel stringers, rounded checkered steel plate treads and wrought iron pipe handrails and connected to platform which shall be constructed of steel framing, hangers, etc., consisting of channel, I-Beams, angles, tees, plates, etc. The platforms shall be of Subway grating Type-AA, and provided with W.I. pipe handrails. Furnish all channels and hangers required for setting in concrete slab before same is poured.

### 3.18 Fuel Oil Tank Chamber Platform Ladder, Etc.

3.18.1 Furnish and install complete in the fuel oil tank chamber, steel plate platforms, wrought iron pipe railings, iron ladders, all as indicated on drawings.

3.18.2 Platform shall be of 1/4 inch checkered steel plate, ladders and pipe railings shall be as specified in Section 5B.

### 3.19 Steel Hangers, Ladder Racks, Broom and Mop Racks, Etc.

Furnish and install steel racks for ladders, floor brushes, mops, etc. in janitor's sink closets and sink closets, pipe and lumber racks in custodian workshop and supply room, engineer's closet. All of this equipment shall be securely fastened to the walls or partitions. The mop and broom racks shall be the eccentric type equal to sample in office of the Contracting Officer.

### 3.20 Miscellaneous

Include all other miscellaneous metal work. All work to be embedded in concrete work or in connection with bolts, anchors, inserts, etc., shall be furnished at the proper time for setting.

### 3.21 Painting

#### Shop Coat

All miscellaneous metal work before leaving the shop shall be cleaned of all scale, rust and dirt.

3.21.1 Before erection, all steel lintels in exterior walls shall have all damaged surfaces of shop coat touched up.

3.21.2 After erection all damaged surfaces of shop coat shall be touched up.

### 3.22 Inspection

Make all required measurements in the field to ensure proper and adequate fit.

### 3.23 Discrepancies

3.23.1 Immediately notify Project Manager

3.23.2 Do not proceed until fully corrected.

### 3.24 Erection

3.24.1 Coordinate with other trades involved.

3.24.2 Before erection, all steel lintels in exterior walls shall have damaged surfaces of shop coat touched up.

3.24.3 After erection, all damaged surfaces of shop coat shall be touched up.

END OF SECTION 05000



## SECTION 05510

### METAL STAIRS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of metal stairs. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.1 Temporary Stairs: Should the Contractor erect the permanent stairs as a temporary stairs he shall provide wood treads over steel pan.
- 1.2 Shop Drawings: A) Prepare complete shop drawings of all stair work; B) These drawings shall be submitted to the Contracting Officer for approval; C) Assume all responsibility for the correctness and accuracy of design and installation, and take and verify all measurements at the building; D) Provide all work and material necessary to comply with requirements of the Municipal Code for such stairs.
- 2.0 PRODUCTS:
- 2.1 Steel Plates, Shapes, and Bars: ASTM A 36.
- 2.2 Steel Bar Grating: ASTM A 569.
- 2.3 Gray Iron Castings: ASTM A 48, Class 30.
- 2.4 Malleable Iron Casting: ASTM A 47.
- 2.5 Cast Aluminum: ASTM A 283, Grade A.
- 2.6 Metal Pan Treads: Pressed or structural steel pans, ASTM A 446, Grade B, shop coated, with a minimum depth of 2 inches for concrete fill.
- 2.7 Cast Metal Treads shall have an integral non-skid surface.
- 2.8 Grating and Metal Pan Treads shall have cast metal non-skid nosings.
- 2.9 Finish: Steel plates, shapes, bars, and grating shall be galvanized in accordance with ASTM 386 or primed with fabricator's standard shop primer as directed.
- 2.10 Fabrication: Stair units shall be shop riveted, welded or bolted. Units shall be shop-assembled to ensure fit. Stairs are to be shipped in the largest units practical to reduce field erection time. All fabrication shall conform to AISC Manual and ASTM A 6.
- 2.11 Rivet Steel shall comply with ASTM A-141, latest edition.
- 2.12 All steel and iron used shall comply with the requirements of the Corpus Christi Army Depot Building Code, and all stresses shall be governed by these rules.
- 3.0 EXECUTION:





- 3.1 Erection: Erect stairs level and plumb. Treads shall be level both front to back and across the width. Stair units shall be securely fastened to floors and landings. Field erection shall be in accordance with AISC Manual except that connections shall be bolted only.
- 3.2 Stairs:
- 3.2.1 Stairs (except as otherwise indicated) shall be constructed as shown on details, with steel plate stringers, combined steel plate risers and pans to receive bluestone treads, pipe handrails, tubular steel newel posts, steel panels, with intermediate horizontal and vertical tube rails and handrails. Also provide all angles, plates, channels, and I-beams at half-story platforms.
- 3.2.2 Platforms and landings shall be of reinforced concrete finished with vinyl composition tile or other wearing surfaces as required.
- 3.2.3 Portions egress stairs and other stairs shall be constructed, with steel plate strings. "Feralun" or other approved treads or checkered steel plate treads, and pipe handrails.
- 3.2.4 "Feralun" or other approved treads shall be 7/16 inch thick, gray cast iron, hatched design surface. Wearing surface of abrasive grit shall be cast into the metal. Treads shall be secured in place with 3/8 inch flat head bolts. Submit sample of treads for approval. Brackets for treads and risers shall be of angle irons securely attached to strings.
- 3.2.5 The frames to receive wire mesh panels in connection with stair work shall be furnished and installed under this section.
- 3.2.6 Risers for stairs specified in Paragraphs wherever 4'-9" or wider, shall be of 3/16 inch crimped steel plates. Stairs less than 4'-9" in width, shall be 10 gauge crimped steel plate.
- 3.2.7 The railings of egress stairs shall be constructed of 3/16 inch seamless tubular steel newel posts or continuously welded tubular steel newel posts (hot rolled flash removed mechanical steel tubing) with a frame between newel posts consisting of top, bottom and intermediate tube rails and solid vertical posts of sizes and shapes indicated, with the lower panels of frame filled with 3/16" steel plate. All joints at tubing shall be welded smooth. The vertical solid posts shall be fillet welded to steel filler, steel filler fillet welded to stringer. The lower horizontal rail of frame shall be tap screwed to an angle riveted to stair. Submit shop drawings for approval showing complete construction and assembly.
- 3.2.8 Handrails shall be of wrought iron pipe, 1 inch nominal diameter, supported on cast-iron brackets and wall plates secured to walls. The bends in extensions to fit into the pipes. Pipes and bends shall be riveted together with imperfections, and shall be smooth and clean for painting. Center rails and standards in egress stairs will be 1 1/2 inch and 2 inch nominal diameter pipe secured as required.
- 3.2.9 Furnish and install the 2" x 2" x 3/16" steel tubing at wire mesh barrier at stairs. Wire mesh barrier shall be furnished and installed under another section.
- 3.3 Miscellaneous Stairs:
- 3.3.1 Stairs to Projector Closet, Boiler Room, and the like shall be constructed of steel plate or channel stringers, checkered steel plate treads, and pipe handrails.
- 3.3.2 Treads shall be checkered steel of standard indent pattern, front shall be bent down to form nosing and bent up at back where risers are omitted. Where required, provide top tread of similar material.
- 3.4 Metal Tread Nosing On Interior Concrete Steps:



## 05000 - Metals

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- 3.4.1 Furnish and set securely on all interior concrete steps, 6 inch wide safety nosing. Nosings shall be "Feralun" type, Style A, with cast iron anchors as manufactured by American Abrasive Metals Company, or approved equal. Nosings shall be 12 inches shorter than stair widths.
- 3.5 Window Guards:
- 3.5.1 Furnish and erect guard rails across window openings where required in stair enclosures. Rails shall be constructed of 5/8 inch square bars spaced 5-1/2 inch maximum (on center) , welded into a steel channel frame secured to 1-1/2 inch, 14 gauge tubular frame.
- 3.5.2 Furnish and install window guards in certain enclosures of 14 gauge, 1-1/2 inch square section tubing, all intersections continuously welded and ground smooth, secured in place with 14 gauge clip angles and 3/8 inch expansion bolts. Submit shop drawings for approval.
- 3.6 Painting:
- 3.6.1 All stair work with the exception of the tops of the C.I. treads shall be painted one shop coat specified in Section 09900.
- 3.6.2 Immediately after erection, all open joints shall be filled with a suitable putty and all bolts, rivets damaged surfaces of shop coat , and all rough surfaces shall be scraped clean, smooth, and then shall be touched up with one shop coat.
- 3.7 Connections:
- 3.7.1 Steel stairs shall be connected to the structural steel framework before concrete arches and fireproofing are installed. In a reinforced concrete superstructure or portion thereof, the steel stairs shall be secured to the concrete superstructure as indicated on drawings.
- 3.7.2 All connections of principal members shall be made with rivets having exposed heads countersunk and chipped, or with bolts having flush countersunk heads, or with hemispherical rivet or bolt heads exposed. Connections shall be made in conformity with the Contracting Officer standard connections for stairs.
- 3.7.3 Minor connections such as brackets to stringers, shall be riveted; treads to risers shall be bolted using hexagonal nuts where same are exposed; rivet heads on finished face, countersunk and chipped.
- 3.7.4 The option of using welding wherever riveting is shown in stair construction will be permitted. Such welding shall consist of welding within a hole (of diameter determined by the Contracting Officer) in the carrier angles.
- 3.7.5 Welding shall not be "plug welding", but shall be done by means of fillet welds around the circumference of the hole and then evened in to fill the entire hole.

END OF SECTION 05510



## SECTION 05550

### KITCHEN CASEWORK

#### PART I -GENERAL

##### 1.1 RELATED DOCUMENTS

The general provisions of the contract, *including* general and supplementary conditions and general requirements apply the work specified in this section.

##### 1.2 DESCRIPTION

###### A. Work Included

1. This section includes, but is not limited to, all materials, labor and equipment to furnish, deliver and install all metal kitchen cabinets, sinks, shelving, counters, exhaust hoods and all miscellaneous fillers and panels required as shown on the drawings for a finished Installation.

###### B. Related work specified elsewhere:

##### 1.3 QUALITY ASSURANCE

- A. Comply with all provisions of specifications for the design, quality testing, manufacturing and installation of metal kitchen cabinets and specified equipment
- B. All metal cabinetry and equipment herein shall be the product of one manufacturer and be the one on which this specification is based or approval of substitutes must be obtained In writing from the Corpus Christi Army Depot Purchasing Department ten days prior to the bid due date. All manufacturers other than the specified product shall provide evidence of having a minimum of five years experience in the manufacturing and installation of stainless steel kitchen cabinetry.
- C. The manufacturer shall, from one year to date of installation, warrant parts or product manufactured and finished against manufacturing defects in material and any such parts which under normal use prove defective within one year from date of installation, shall be repaired or replaced without charge to the Contracting Officer.
- D. Wood shall not be used In any portion of the casework construction whether exposed or hidden from view.

##### 1.4 SUBMITTALS

###### A. Shop Drawings

1. Identify location of metal cabinetry and related items.
2. Detail cabinets, shelving, countertops, etc, in related and dimensional position, with sections. Locations for roughing-in of plumbing, including sinks, faucets, strainers. cocks, etc. shall be included.



## 05000 - Metals

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### B. Certificates

All bidders shall provide to the Contracting Officer independent test results from a nationally recognized testing laboratory on the finishes required for this project with the bid.

## PART 2 - PRODUCTS

### 2.1 MATERIAL

A. All metal cabinetry shall be fabricated of Type 304 stainless steel free of scales, blemishes or other defects.

B. Minimum metal gauge:

All minimum thickness of metal referred to herein shall be U.S. standard gauge.

1. 20 Gauge: Inner door panels, inner and outer drawer panels, drawer body, and shelves.
2. 18 Gauge: Outer door panels, sides, backs, bottoms, and tops.
3. 16 Gauge: Top rails, cross rails, drawer slides.
4. 14 Gauge: Leveling and corner gussets.

### 2.2 FABRICATION

A. Workmanship

1. Align sides, top rails, bottoms and vertical stiles, at intersections, without overlap.
2. Grind exposed welds flush and smooth.

B. Cases

The sides of cabinets shall be formed to make a rabbeted stile 1-1/8" wide. Top of case stiles shall be closed by a mitered 45 degree bend from top of case side. Stiles shall be closed by welded channel which contains front shelf adjustment louvers. All case members including intermediate cross rails shall be welded for maximum strength. Use of sheet metal screws to hold intermediate cross rails in place is not acceptable. Sides of all cabinets shall be free from any holes to prevent dust and bacteria from entering the cabinet. Prepunched holes in the side of any cabinet shall not be allowed. All drawer cabinets and cupboard cabinets shall have full backs and bottom welded into place. Any cabinet without backs or bottoms will be rejected. All interior bottoms of base and tall cabinets shall be turned down to provide a clean, flush interior free from dust catching ledges and preventing bacterial accumulation. Bottoms of all wall units shall be flush; recessed bottoms are not acceptable.

C. Doors

Doors shall be double panel reinforced construction 5/8" thick and sound deadened with vertical steel battens. Door fronts and liners shall be welded together for added strength. Door fronts and liners shall be slotted to receive hinges. Hinge wings must be concealed when doors open. Wrap around type hinges are not acceptable. All doors shall have soft rubber bumpers for quiet closing. Rubber bumpers must be securely locked in place. Rubber bumpers attached by adhesives are not acceptable. All corners of doors shall be welded and ground smooth.



Sliding doors shall be double panel reinforced construction 5/8" thick and operate on nylon rollers suspended from stainless steel track at top of unit and center guide at bottom. Sliding doors shall have recessed door pulls.

D. Drawers

Drawer front shall be double panel reinforced construction with 5/8" thick fronts and sound deadened with vertical steel battens. Drawers shall be all welded construction. All drawers shall have soft rubber bumpers for quiet closing. Rubber bumpers must be securely locked in place. Rubber bumpers attached by adhesives are not acceptable. All edges of drawer fronts shall be closed.

Drawer bodies shall be formed from a single sheet of steel including the bottom, two sides, back and inner front. Interior bottoms of drawers shall be fully covered on four sides for ease in cleaning. The top front of the inner drawer shall be offset to interlock with the outer drawer front.

Flanges on the top of drawer body shall be fully formed channel and bent at a 6 degree angle for maximum strength. Flanges shall be formed to leave the inside of the drawer free from sharp edges. Drawer slide shall be welded to drawer body and be part of a "Z" shaped member in a wrap around design to support drawer body. Drawer slides shall have a 15116" nylon fired ball bearing roller. Drawer slide shall be roller type, positive in action permitting drawer to be fully opened, yet preventing drawer from accidental removal. Case slides shall be a formed piece of galvanized steel with a 16/16" nylon fired ball bearing roller at front of slide. All ball bearing rollers for drawer slide and case slide shall be prelubricated to guarantee a smooth, quiet operation. All drawers shall rise upward when opened to prevent engaging of drawers and doors below. Drawers shall have self-closing design during the last 5" of travel.

E. Shelves

Shelves shall be formed from a single sheet of stainless steel with 7/8" face turned back and up at a 30 degree angle and edge of flange shall make firm contact with underside of shelf for sound deadening. All shelves in cabinets shall be adjustable on 1-1/2" center and supported by stainless steel clips placed in embossed louvers. All shelves shall be solid.

F. Hardware

Door catch shall be positive type latch located at upper inside edge of door. Stainless steel strike bracket shall be installed inside of door with accessible removable screws. Bolt shall be nylon self-closing type tested for 300,000 opening and closing cycles. Complete bolt housing shall be recessed behind cross rail. Roller catches and/or friction catches are not acceptable.

G. Hinges

Hinges shall be institutional type, 2-1/2" long, with a metal thickness of at least .09", containing 5-knuckles, and centered 3" above bottom and below top of door. Doors 45" high and over shall have an additional hinge in center. Hinges shall be stainless steel with smooth rounded joints for easy cleaning. When door is closed, only the joint shall be exposed. Both hinge wings shall be encased, one within the door, the other within the case. Hinges shall be attached to the door and the case by screws. Hinges welded to door and/or case are not acceptable.

H. Door and Drawer Pull



## 05000 - Metals

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Door and drawer pull shall be stainless steel with a brushed satin finish. Shoulder screws shall be used so that when handles are mounted they do not cause the door to buckle or cave. Sliding doors shall have recessed door pulls.

### 1. Base Cabinet Logs

All Base cabinets and sink units shall be furnished with integral stainless steel legs with adjustable levelers. Bottom of base cabinets shall be approximately 6" above the floor.

### J. Locking Mechanism

All cabinet doors shall be provided with stainless steel angle hasps, with half inch diameter holes for pad locking, as shown on the drawings. The left door of each door pair shall have a sliding flush bolt on the inside face, as shown on the drawings, to prevent the pair of doors from swinging open when pad locked.

## 2.4 KITCHEN CABINETS PERFORMANCE REQUIREMENTS

### A. Base Cabinets.

#### 1. Cabinets Load Test

A Wide standing height combination cupboard and drawer cabinet shall be free-standing with installed counter top. Cabinet shall sit 1/4" off the floor on all four leveling screws and be capable of supporting a uniform distributed load of 2,000 lbs. Door and drawer operation shall not be affected by the load.

2. Leveling device for floor mounted cabinets shall be capable of supporting a load of 500 lbs. without failure and capable of adjustment after load is removed.

#### 3. Cabinet Door Test

An open door shall withstand a load of 200 lbs. applied directly at the outer edge.

Door shall be moved through a 180 degree arc and weight removed. Operation of the door after test shall be normal without distortion that will adversely affect operation of the door catch.

#### 4. Life Cycle Test.

a. Door hinge shall operate for 300,000 opening and closing cycles without a failure.

b. Positive door catch shall operate for 300,000 opening and closing cycles without a failure,

c. Drawer shall be tested and operated with a load of 100 lbs. for a minimum of 150,000 opening and closing cycles. After test, drawers shall operate freely without evidence of dragging or scraping,

### B. Wall Cabinets

1. A 48" wide, 30" high, 12 3/4" deep hinged wall case shall support a load of 100 lbs. on cabinet bottom and 100 lbs. on each adjustable shelf for a total of 300 lbs. Cabinet shall not show any significant permanent deflection of cabinet, cabinet bottom or shelves. Doors shall operate smoothly when cabinet is fully loaded.

2. An adjustable shelf shall support a uniformly distributed load of 100 lbs. When load is removed, shelf should show no significant permanent distortion.



3. Performance of hinge and catch shall be the same as used on bass cabinets.

## 2.5 WORKING SURFACES

### A. Stainless Steel

Sink and counter tops shall be fabricated of 16 gauge, Type 304, 18.8 solid stainless steel formed down and back making a 1 1/2-6 high face on all exposed edges. Drainboards and cabinet tops shall be rigidly reinforced the full length of the top, Drainboards shall be two-way pitched to the bowl to provide drainage without channeling or grooving. Drainboards, flanges and splashes shall be Integral, being formed from one sheet of metal. Raised edge surrounding unit shall be seamless die formed at front and ends of unit. Sink bowls shall be fabricated of 16 gauge, Type 304, 18-8 solid stainless steel seamless electrically welded to drainboard. AN joints shall be electrically welded, ground and polished to a satin finish. Entire units shall be electrically welded, ground and polished to a satin finish. Entire units shall be thoroughly sound deadened on the under surface with sprayed or trowelled undercoating. Wood shall not be used. All tops shall have stainless steel runners to facilitate fastening to cabinets.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install cabinets, shelves, counter tops and other equipment level and square. Install sink units to provide positive drainage of bottom surface of the sinks.
- B. Wall cabinets shall be hung from the metal stud framing system wherever possible. If the wall cabinets must be hung from the wall surfacing at any location, proper anchors shall be used. Install wall cabinets level and aligned.
- C. Install base cabinets firmly on the ground. Level all the surfaces by adjusting the log levelers. Attach countertop to insulated base cabinets with stainless steel screws as required. Caulk with silicone all around counter tops where it interfaces with the existing walls. Install the flat back panels to the wall surfaces by the most appropriate method and caulk as required.
- D. All work, including installation of new casework, flooring, ceiling, ductwork, etc., as well as the demolition of the existing casework, flooring, etc. shall be completed within three (3) consecutive days of work start

### 3.3 INSPECTION

- A. Inspect installed work of other trades and installation conditions for acceptability. Inform the Contracting Officer of discrepancies that will Jeopardize a complete and proper installation.
- B. Cleaning

Touching up marred and/or abraded finished surfaces, clean components to post construction accepted levels, remove crating and packing materials, broom sweep premises.

END OF SECTION 05550



## SECTION 05700

### ORNAMENTAL METALS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of Trap Pit Doors; Access to Pipe Trenches; Subway Type Gratings; Manhole, Catch and Retention Basins, Hoods; Iron Fences and Railways, Wicket Guard and Fence; Pipe Railings; Chimney Caps; Cast Iron Sills; Expansion Joints; Chimney Cleanout Doors; Ladders; Ladder Rungs; Vent Back Frames in Exhaust Opening of Toilet Rooms; Grilles in Exhaust Openings in Toilet Rooms; Access Doors, Dressing Compartment Seat Frames; Stainless Steel ; Lumber Rack; Ganging Rods; Auditorium Loudspeaker Grilles; Bronze Saddles (Exterior), Bronze Expansion Saddles (Interior); Bronze Pipe and Tubes; Aluminum Hat and Coat Racks and Hook Strips; Aluminum Angles for Showers; Aluminum Railings; Miscellaneous Ornamental Metal Work; Hardware.

1.1 Product Handling:

1.1.1 Before shipment to the job, all finished shall be adequately protected for transporting and erecting periods.

1.1.2 Replace damaged items with the approval of the Contracting Officer and at no additional cost to the Contracting Officer.

1.2 Shop Drawings:

1.2.1 Show all locations, markings, quantities, materials, sizes and shapes.

1.2.2 Indicate all methods of connecting, anchoring, fastening, bracing and attaching work of other trades.

1.2.3 Do not fabricate until approval of Shop Drawing by the Contracting Officer.

2.0 PRODUCTS:

2.1 Frame and Covers:

2.1.1 Aluminum: ASTM B 221, 6063-T6.

2.1.2 Bronze: ASTM B 455, Alloy C 38500.

2.1.3 Stainless Steel: ASTM A 167, Type 304.

2.2 Gratings:

2.2.1 Aluminum Grating, Banding, and Kick Plate: Rectangular, pressure-locked bearing bars, ASTM B 221, 6063-T6, mill finish.

2.2.2 Steel Grating:

2.2.3 Grating: Rectangular, welded, ASTM A 569.

2.2.4 Bands and Kick Plate: ASTM A 36.

2.2.5 Finish: Galvanized, ASTM A 386, or painted with fabricator's standard shop primer.

2.3 Castings ( Frames, Covers, Steps, and Sills):





- 2.3.1 Gray Iron: ASTM A 48, Class 30. Malleable Iron, ASTM A 47.
- 2.3.2 Steel: ASTM A 36; Galvanized, ASTM A 386.
- 2.3.3 Aluminum: ASTM B 26, 356-T6.
- 2.3.4 Stainless Steel: ASTM A 743, Grade CF8 or CF20
- 2.3.5 Bronze: ASTM B 455, Alloy C38500 and ASTM B 135, Alloy C2800.
- 2.3.6 Corner Protection: Steel angles with anchors, ASTM A 36; Galvanized, ASTM A 386.
- 2.3.7 Ventilation Boxes: Extruded Aluminum, ASTM B 221, 6063-T6.
- 2.4 Pipe and Tube Railings and Ladders:
- 2.4.1 Post and rails: Steel pipe, ASTM A 53, Type E or S, Grade B, Schedule 40.
- 2.4.2 Bars and Rungs: ASTM A 36.
- 2.4.3 Finish: Galvanized, ASTM A 386 or shop primer, Fed. Spec. T T -P-86, Type I or II; TT-P-615, Type I, II, or V; TT-P-645.
- 2.4.4 Aluminum: ASTM B 221, 6063- T6, T-52.
- 2.4.5 Steel: ASTM A 36, A 500, A 501.
- 2.4.6 Stainless Steel: ASTM A 544, Grade MT304; ASTM A 312, Grade TP304; ASTM A 167, Type 304
- 3.0 EXECUTION:
- 3.1 Trap Pit Doors: Furnish and set trap pit doors and frames flush with the finish floors, pavement, grade or as otherwise required. Doors for interior pits shall be of 1/4 inch checkered steel plate set in angle frames having mitered and welded corners and angle seat for covers, provided with bronze lifting handles. Doors and frames for exterior pits shall be of cast iron and hinged with 3-1/2 x 5 inch extra heavy bronze hinges. All doors shall be provided with locking devices.
- 3.2 Access To Pipe Trenches:
- 2.2.1 Checkered or flat steel plate access doors to pipe trenches below cellar floors shall be made in accordance with detail. Include angle iron frame, anchors, hardware, etc., complete. The steel plate access doors shall be flush with the adjoining floors. Hinges shall be approved bronze flush type. Provide bronze lift handle and approved locking device for each access door.
- 3.2.2 Doors shall be covered with resilient tile where required. Where cement floors occur, top of steel cover shall be flush, but depressed for other finishes as required by the thickness of floor finish. See other Sections of Specifications for Finish.
- 3.2.3 All doors under this section unless otherwise specified, shall be secured in place with bronze square shank locking device and brass deck plate with slot and socket holes. Furnish six (6) wrenches for brass deck plates for each different size of locking device.
- 3.3 Not Used
- 3.4 Manhole, Catch and Retention Basins, Hoods:



## 05000 - Metals

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- 3.4.1 Furnish cast iron manhole covers, catch basin covers and cast iron hoods for masonry, manholes, catch basins and retention basins furnished and installed under Section 4A.
- 3.4.2 Manhole covers and frames for catch basins shall be of cast iron with locking device and key equal to Flockhart Company No. 35-139.
- 3.4.3 Covers and frames for catch basins No. 1 and No. 4 shall be of cast iron with locking device and key equal to Flockhart Company No. 35-328. Covers and frames for catch basins No. 2 and 3 shall be of cast iron with locking device and key equal to Flockhart Company No. 18-919.
- 3.4.4 Cast iron hoods for catch basins No. 3 and 4 and manhole No. 2 shall be equal to Flockhart Company pattern number indicated.
- 3.5 Iron Fences and Railings:
- 3.5.1 Furnish and erect iron railings, fences, and gates. Materials of fences and railings shall be medium steel, shapes as required.
- 3.5.2 Posts and braces shall be leaded into cast-iron shoes, which shall be embedded in the concrete pavements or blocks. Center picket of each panel of 6 foot fence shall be leaded 2 inches into curb or pavement. Fences and railings on stone copings, platforms, steps or check blocks shall be leaded into sockets cut in same. Gates shall be hung with hinges. Provide all hasps required for locking gates in both open and closed positions. Double and quadruple gates shall also be furnished with sliding lever bolts and galvanized, malleable iron catches having pipe anchor and drain embedded in concrete. Gates shall be locked open or closed with Type C Padlocks. Rivet the padlocks to the gates as required. Single gates require 1 padlock; double gates, 2 padlocks; quadruple gates, 4 padlocks.
- 3.5.3 Furnish cast-iron shoes for fence posts and set them at the proper time so that they may be cast into the concrete footing and pavements with top flush with finished surfaces.
- 3.5.4 Folding swing gates shall have fast pin to hold in closed position.
- 3.5.5 Unless otherwise required center rails and side rails on outside steps shall be made of 1-1/4 inch solid posts with 2-1/2 inch by 1/2 inch horizontal flats spaced as required, with top rail of two bronze, aluminum or steel channels and steel stiffener. Post at upper level of center railings shall be of malleable cast iron of height required, tapering from 1-3/4 inches at bottom to 1-1/4 inches at top, with finial. All posts shall be leaded-in 4 inches in cheeks and steps.
- 3.6 Wicket Guard And Fence: Furnish and install wicket guard fence 12 inches high constructed of 1/2 inch round bent steel rods welded together, to form a continuous wicket fence around the concrete curbing at seeded and planted areas. This guard fence shall be set in concrete footing specified under Section 03305.
- 3.7 Pipe Railings:
- 3.7.1 Furnish and erect wrought iron or steel pipe railings and hand rails together with all fittings, flanges, collars, brackets, bolts, etc. of sizes required, all put together and secured in place in a thorough manner. All pipe railings shall be welded assembly, with continuous "V" joints, full thickness of pipe wall, welds filled solid and ground smooth. All radii, curves, sweeps, bends, etc. as indicated on details for pipe fitting assembly shall be maintained in the welded assembly. For pipe hand rails in connection with stairs, see Section 05510.



- 3.7.2 Center pipe rails and free standing end pipe railings on outside concrete steps shall be made of 1-1/2 inch nominal diameter pipe and have pipe uprights with cast-iron collar and cap fittings secured in place with tap screws. The uprights shall be leaded-in pipe sleeves. Upright at upper level of center radii shall be of 2 inch nominal diameter pipe with approved cap.
- 3.7.3 Hand rails at side of outside steps against walls shall be 1 inch nominal diameter pipes, with returns against wall at ends, and supported on galvanized cast-iron brackets and wall plates same as specified for egress stair.
- 3.7.4 Hand rails at side of outside steps against iron fences shall be 1 inch nominal diameter, with returns at ends and supported on wrought iron brackets and plates. Hand rails at area walls shall be 1-1/4 inch nominal diameter.
- 3.7.5 All outside pipe railings and hand rails including fittings, etc., shall be galvanized after fabrication.
- 3.7.6 Furnish the combined pipe sleeve and base plate and turn over same for setting in concrete work.
- 3.7.7 Exterior barrier rails (at areaways, etc.) shall be of 1-1/2 inch nominal diameter pipe; interior barrier rails ( at pits, changes in floor levels, etc. ) shall be 1-1/4 inch nominal diameter.
- 3.8 Chimney Caps: Chimneys shall be provided with cast-iron caps.
- 3.9 Cast-Iron Sills: Furnish cast-iron sills for exterior doors of bulkheads, etc. The sills shall be set in a bed of cement and be substantially secured with bolts or expansion bolts.
- 3.10 Expansion Joints: Furnish and install all rolled steel members with required anchors at structural expansion joints through slabs. Items cast in concrete shall be furnished when required for setting. Provide bronze plates as required; top surfaces of plates shall be "BRONZOGKIT" or approved equal.
- 3.11 Chimney Cleanout Doors: Furnish to the mason proper cleanout doors of sizes indicated for chimneys, of 10 gauge steel plate and steel flats. The doors shall have angle-iron frames with strap anchors. Hang the doors with two 4 x 4 inch steel hinges and secure each with a latch.
- 3.12 Ladders: Furnish and set ladders 18 inches wide, constructed with steel plate stringers, 3/4 inch diameter single rung treads let in and welded to stringers, angle and flat braces , and when required shall have pipe hand rails all riveted together. Secure ladders with angle clip and expansion bolts at top, bottom and elsewhere as required.
- 3.13 Ladder Rungs:
- 3.13.1 When ladder rungs are indicated built into mason work, furnish to the mason 5/8 inch galvanized wrought-iron ladder rungs.
- 3.13.2 Ladder rungs in concrete shall be 15 inches wide and shall be built into concrete every 14 inches in height projecting into walls 4 inches on each side.
- 3.13.3 Ladder rungs in brickwork of chimney shall be 18 inches wide, and shall be built into brickwork every 5 courses in height, project 8 inches beyond face of wall and continue 8 inches into wall with a 2 inch return. First rung shall start 10 feet above roof level at chimney.



## 05000 - Metals

- 3.14 Vent Back Frames In Exhaust Opening Of Toilet Rooms: Furnish and install 12 gauge bent steel frames in exhaust openings in partitions of toilet rooms. Frames shall be set plumb in partitions to receive the vent grilles. Baffle plates are not required.
- 3.15 Grilles in Exhaust Openings:
- 3.15.1 Furnish and set in frames at exhaust openings in toilet partitions, approved pressed steel bar type grilles with baked on primer, as manufactured by Tuttle and Bailey, Catalog No. T-80 , or approved equal. Grilles shall be secured with tap screws to the frame. The bars of grilles shall be fixed and of rigid construction and shall be set at the angle required. Submit sample of grille for approval.
- 3.15.2 Furnish and install individually adjustable shutters attached to grille frames, in certain toilets where required. Grilles shall be bar type, equal to Register and Grille Mfg. Co. No. 3311 or Tuttle and Bailey No. A-77.
- 3.15.3 In general, vent openings are provided in partitions of all toilet rooms back of water closets; however, certain smaller toilets, are mechanically vented by means of vent openings in ceiling or in partitions close to ceilings.
- 3.16 Access Doors:
- 3.16.1 Access doors and frames that are to be furnished and installed in masonry walls and partitions as part of the work of this Contract, shall be constructed as required for hollow metal access doors and frames, and shall be furnished and installed under Section 08110.
- 3.16.2 Access doors and frames that are to be furnished and installed in metal lath and plaster walls and ceilings as part of the work of this Contract shall be constructed of high grade sheet steel with 16 gauge frames and 14 gauge doors. Doors shall be equipped with concealed hinges and cylinder locks all keyed alike ( furnish six (6) keys); doors in ceilings may have screwdriver operated type of lock. Doors shall have one piece plain trim set flush with finish surface. Stock doors manufactured by Columbia Metal Product Co., Karp Metal Products Co., or approved equal, complying with the specifications may be accepted. Submit sample for approval if not already approved.
- 3.16.3 For access doors and frames furnished by other contractors and set in place as part of the work of this Contract, see Masonry sections for access doors and frames set in masonry, and Section 09210 for access doors and frames set in metal lath and furring.
- 3.17 Dressing Compartment Seat Frames: Where seats are indicated in dressing compartments, furnish and set 1/4 x 1-1/2 inch flat galvanized bent steel brackets.
- 3.18 Stainless Steel:
- 3.18.1 Stainless Steel and Cabinet Top Supports: Furnish and install adjustable, stainless steel tubing forming legs to support the tops of sinks and cabinets together with the stainless steel screens, collars, plates, etc., of sizes required. The screens shall be wrapped around the legs of sink tubing and tap screwed to same.
- 3.18.2 Stainless Steel Jambs at Dressing Compartments: Furnish and install 14 gauge stainless steel tube jambs at doors to dressing compartments adjoining shower stalls. These jambs shall be anchored to the structural facing tile partition with 14 gauge stainless steel straps.
- 3.18.3 Package Slide: Furnish and install stainless steel half round strips and anchors (type 304 (18-8) ) for package slide to Receiving Room. Strips shall be plug welded to anchors.



- 3.18.4 Angle and Channel Guards: Furnish and install angle and channel guards in the kitchen and auxiliary areas. Guards shall be 12 gauge stainless steel satin finish of length and dimensions required, secured in place with oval head stainless steel bolts in expansion shields.
- 3.18.5 Stainless Steel Shelf: Furnish and install stainless steel shelves complete with brackets, of gauges required, generally in helps' locker room, over sinks in locker rooms, in eraser cleaning closets, art room and medical office.
- Note: All stainless steel shall be chrome nickel cold rolled alloy designated by trade name Stainless Steel 18-8, No. 4 Finish; it shall contain a minimum of 18% chromium, 8 % nickel, and not more than 0.12 % carbon, non-magnetic (straight chrome iron not accepted).
- 3.19 Lumber Rack: Furnish a lumber rack for the woodworking room and general crafts shop, constructed with angles and provided with chains and hoods as required.
- 3.20 Hanging Rods: Furnish and erect hanging rods of diameters required of wrought-iron or steel pipe supported on approved hangers, brackets or flanges cabinets, closets and elsewhere throughout the building where required.
- 3.21 Auditorium Loudspeaker Grilles:
- 3.21.1 Furnish and install complete, two (2) loudspeaker grilles in Auditorium. Grilles shall be equal to Blumcraft Deluxe-Line. Grille facets shall have a bronze anodized finish on faces and brushed finish on backs. Supporting bars #258 to have dull black anodized finish.
- 3.21.2 Frame of grilles shall be equal to Blumcraft's trim section WF - 4, anodized black, and be secured to masonry with stainless steel screws (slack painted heads) in expansion shields.
- 3.21.3 Sub-frame shall be formed from 1/4" thick aluminum bar with corners mitered, continuously welded and ground smooth and firmly secured in place. Provide continuous piano hinge with 3/16" stop angle.
- 3.21.4 The inside surface of grille shall be entirely covered with black grille cloth equal to "Acousticloth", as manufactured by Merlang or "Lumite", as manufactured by Chicopee. Grille cloth shall be fastened in place. Submit samples for approval.
- 3.21.5 Include continuous angles and all other angles, plates, bars and reinforcing channels, all as required.
- 3.21.6 Contractor is to verify all dimensions at job before fabricating any of the work.
- 3.21.7 Loudspeaker enclosure and sound absorbing blanket will be furnished and installed as part of the work of Section 7B.
- 3.22 Bronze Saddles (Exterior): All exterior door saddles shall be of bronze unless otherwise indicated. White bronze shall be provided for aluminum doors. Finish shall be "Bronzogrit" or an approved equal.
- 3.23 Bronze Expansion Saddles (Interior): Furnish and install bronze expansion saddles generally in the following areas: doors opening off auditorium platform or stage; gymnasium; dance room. None required in store room. Saddles shall consist of bronze flats, plates, and angle clips. Installation shall allow for 3/4 inch expansion. Exposed surfaces of plates and flats shall be "Bronzogrit" or approved equal.



## 05000 - Metals

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- 3.24 Bronze Pipe and Tubes: Furnish 1 inch square bronze tubes in toilet rooms and pipe spaces. Tubes shall be turned over to mason for installation. Tubes shall be of proper length (not less than full thickness of wall) and provided with bronze wire bars at one end.
- 3.25 Aluminum Hat And Coat Racks And Hook Strips:
- 3.25.1 Furnish and install hat and coat racks and hook strips in locations required. Racks and hook strips shall be constructed of aluminum channels, flats and tubing of sizes required, toggle or expansion bolted to walls to suit conditions. Aluminum shall have alumilite finish.
- 3.25.2 Submit shop drawings for approval.
- 3.26 Aluminum Angles for Showers: Furnish and install aluminum angle bracing as required. Angles shall have alumilite finish. Submit shop drawings for approval prior to fabrication.
- 3.27 Aluminum Railings:
- 3.27.1 Center and side rails and wall handrails shall be of aluminum when required. Posts and horizontal members shall be solid. Posts shall be 1-1/2 inches square, extend through intermediate rails, secured to top rail with 3/8 inch stud bolts; posts at upper level shall be of height indicated, tapering from 1-3/4 inches at bottom to 1-1/4 inches at top, with finial. Posts shall be solidly set with molten sulphur or other approved non-electrolytic material into a combination 1/4 inch pipe sleeve and base plate welded to same, sleeve shall be welded to stair stringer or tread to suit condition, or set in concrete sub-stair.
- 3.27.2 Exterior Aluminum Railings shall be constructed required. Aluminum posts shall be solid 1-1/2 inches square, extend through bottom rail, let into top rail and continuously welded. Center railing shall have tapered aluminum post of size and taper as required for "center rail". Rails shall be formed to shape indicated from, 3" x 1" solid aluminum flats with rounded edges.
- 3.27.3 Roof railing shall be as required.
- 3.27.4 Grab bars in toilets where indicated.
- 3.27.5 All aluminum railings shall have finish equal to 204-C2-Aluminum Co. of America.
- 3.28 Miscellaneous Ornamental Metal Work: Include all other ornamental metal work. Submit shop drawings for approval.
- 3.29 Hardware
- 3.29.1 All hardware specified under Ornamental Metal Work shall match the approved samples in the office of the Contracting Officer. One sample of each item shall be submitted for approval of the Contracting Officer.
- 3.29.2 The key to all locks furnished under Ornamental Metal Work shall be provided with brass tags attached to the key with a strong metal ring or link and be similar to the tags specified under Hardware. The tags shall have stamped upon them the letters Corpus Christi Army Depot and the name or number of the room, closets, etc., for which the keys are intended.
- 3.29.3 All type C padlocks mentioned in this Section will be furnished as specified under Hardware. The Contractor for Ornamental Metal Work shall rivet padlock chains referred to in this Section in place.
- 3.30 PAINTING:



## 05000 - Metals

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- 3.30.1 All Ornamental Metal Work and cast-iron work excepting cast-iron work to be set in concrete and galvanized items shall be thoroughly cleaned and painted one shop coat specified in Section 09900, Painting.
- 3.30.2 After installation, all damaged surfaces of shop coat and all rough surfaces shall be scraped or sanded smooth and then touched up.

END OF SECTION 05700

END OF SPECIFICATION SECTION 05 - Metals



## 05000 - Metals

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## SECTION 06111

### LIGHT WOODEN STRUCTURES FRAMING

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for light wooden structures framing. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
  - 2.1 Grading and Marking: Materials shall bear the grademark, stamp, or other identifying marks indicating grades of material and rules or standards under which they were produced, including requirements for qualifications and authority of the inspection organization, usage of authorized identification, and information included in the identification. The inspection agency for lumber shall be certified by the Board of Review, American Lumber Standards Committee, to grade species used. Except for structural laminated members, plywood, and lumber, bundle, marking or certificates will be permitted in lieu of marking each individual piece.
  - 2.2 Sizes: Lumber sizes shall conform to Prod. Std. PS 20, and unless otherwise specified, lumber shall be surfaced on four sides.
  - 2.3 Moisture Content: At the time lumber and other materials are delivered and when installed in the work their moisture content shall be as follows:
    - 2.3.1 Treated and Untreated Lumber 2 Inches or Less in Thickness, Except Roof Planking: 19 percent maximum.
    - 2.3.2 Treated and Untreated Lumber Over 2 Inches in Thickness, Except Roof Planking: 25 percent maximum.
    - 2.3.3 Roof Planking 2 Inches or More in Thickness: 15 percent maximum.
    - 2.3.4 Materials Other Than Lumber: In accordance with standard under which product is produced.
  - 2.4 Wood Member Design:
    - 2.4.1 Trussed Rafters: As an option to standard rafters, trussed rafters may be provided. Connections shall be made with light metal plate connectors. Light metal plate connected wood trusses shall be designed in conformance with TPI Design Specifications for Metal Plate Connected Wood Trusses and fabricated in conformance with the TPI Quality Control Manual.
    - 2.4.2 Non-stress Graded Members shall include plates, caps, bucks, studs, blocking, nailers, sleepers, and grounds. Members shall be standard grade or No. 2 grade except studs may be stud grade. Non-stress member grades shall conform to the National Grading Rule for Dimension Lumber established in conformance with Prod. Std. PS 20 and as applied in individual grading rules of applicable grading agencies.



## 06000 - Wood & Plastic

2.4.3 Structural Glued Laminated Members shall be in accordance with ANSI A190I. Members shall be sealed with a penetrating sealer and wrapped in accordance with AITC 111.

2.5 Wood Bumper: Species and grade shall be in accordance with the following table:

Grading Rules	Species	No. 1	No. 2
NHLA	Red Oak.	X	
NELMA	Northern Pine		X
	Eastern Hemlock- Tamarack		X
SPIB	Southern Pine	X	
WCLB	Douglas Fir-Larch		X
	Hem-Fir		X
WWPA	Douglas Fir-Larch		X
	Hem-Fir		X
	Douglas Fir-South		X

2.6 Preservative Treatment: Lumber not over 5 inches thick and plywood, when in contact with soil, shall be treated in accordance with AWPB LP-22, LP-33, or LP-44; when specified to be painted or used in built-up roofing systems, AWPB LP-2 or LP-22; and for all other purposes, AWPB LP-2, LP-3, or LP-4. Except as otherwise specified, lumber over 5 inches thick shall be pressure preservative-treated in accordance with AWPB C-2. Structural glued laminated timber shall be treated in accordance with AWPB C-28. Wood treated with oil-borne preservatives shall be clean, free from surface oil, and properly seasoned for use in building construction. Wood treated with water-borne preservatives shall be marked with the word "Dry." Creosote or coal-tar solutions shall not be used. Surfaces of lumber that will be exposed shall not be incised. Exposed areas of treated wood that are cut or drilled after treatment shall receive a field treatment in accordance with AWPB M-4. Items of all-heart material of cedar, cypress, or redwood will not require preservative treatment, except when in direct contact with soil. Unless otherwise specified, all wood members exposed to weather or in contact with soil, water, masonry, or concrete, and all wood framing members directly above soil when the bottom elevation is 18 inches or less above soil shall be pressure preservative-treated. The following items will always be treated:

- All wood members set into concrete regardless of location, including flush-with-deck wood nailers for roofs.
- All wood members in contact with slabs-on-grade, including wood floor sleepers over waterproofed slab surface.
- All wood members in contact with foundation walls.
- Furring strips used on walls or partitions below grade.
- Furring strips used on exterior walls above grade.
- All wood members used for rough framing of openings in exterior concrete or masonry walls.
- All wood members used in exterior exposed construction such as steps, platforms, walkways, and railways.
- Nailing strips used over fiberboard or gypsumboard wall sheathings as a base for wood shingles.



## 06000 - Wood & Plastic

- 2.7 Fire-Retardant Treatment: Fire-retardant treated wood shall be pressure-treated in accordance with AWP A C-20 for lumber and AWP A C-27 for plywood. Treatment and performance inspection shall be by an independent and qualified testing agency that establishes performance ratings. Each piece or bundle of treated material shall bear identification of the testing agency to indicate, performance in accordance with such rating. Treated materials to be exposed to rain wetting shall be subjected to accelerated weathering technique in accordance with ASTM D 2898 prior to being tested for compliance with AWP A C-20 or C-27.
- 3.0 EXECUTION
- 3.1 All Nailing shall be in accordance with the Recommended Nailing Schedule as contained in NFPA Manual for House Framing.
- 3.2 Installation of Timber Connectors shall conform to applicable requirements of the NFPA National Design Specification for Wood Construction.
- 3.3 Members shall be framed for passage of ducts and pipes and shall be cut, notched, or bored in accordance with applicable requirements of the NFPA Manual for House Framing.
- 3.4 Framing shall be kept at least 2 inches away from chimneys and 4 inches away from fireplace backwalls.
- 3.5 Leveling of Joists, Beams, and Girders on masonry or concrete shall be with slate or steel; on wood or metal, leveling shall be without shims.

END OF SECTION 06111



## SECTION 06113

### SHEATHING, SIDING, AND SUBFLOORING

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of sheathing, siding, and subflooring. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS
- 2.1 General: Materials shall bear the grademark, stamp, or other identifying marks indicating grades of material and rules or standards under which produced. Such identifying marks on material shall be in accordance with the rule or standard under which the material is produced, including requirements for qualifications and authority of the inspection organization, usage of authorized identification, and information included in the identification. The inspection agency for lumber shall be certified by the Board of Review, American Lumber Standards Committee, to grade species used. Bundle marking or certificates will be permitted in lieu of marking each individual piece, except for structural laminated members, plywood, and lumber. Size and moisture content shall conform to requirements of the rules or standards under which materials are produced.
- 2.2 Plywood shall be in accordance with Product Standard PS 1, Grade C-D for wall sheathing and Grade C-D with exterior glue for roof sheathing, unless otherwise specified.
- 2.3 Roof Decking Design Stresses shall be as specified for structural members. Decking shall be tongue and groove, V-jointed, and matched and dressed where exposed. As an option, fabricated, laminated lumber decking with interlocking tongue and groove joints may be provided.
- 2.4 Sheathing shall be of either fiberboard, gypsum board, plywood, structural-use panels, or wood for wall sheathing; and either plywood, structural-use panels, or wood for roof sheathing.
- 2.4.1 Fiberboard shall be in accordance with ASTM C 208, sheathing grade, or ASTM D 2277; asphalt-impregnated or asphalt-coated to be water-resistant but vapor permeable.
- 2.4.2 Gypsum Board shall be in accordance with ASTM C 79.
- 2.4.3 Structural-Use Panels shall meet the qualification requirements of APA Performance Standards and Policies for Structural-Use Panels. Panels shall conform to APA Product Guide for Performance Rated Panels for Sheathing, Exp 1 or 2, or Ext; or Structural I Rated Sheathing, Exp 1 or Ext.
- 2.4.4 Wood shall be center-matched, ship-lapped, or square-edge, except exposed roof sheathing shall be V-jointed, matched and dressed. Species and grade shall be in accordance with Table 1 at the end of this section.
- 2.5 Shear Wall Panels shall be of plywood or sheathing conforming to APA Product Guide for Performance Rated Panels for Sheathing, Exp 1 or 2, or Ext; or Structural I Rated Sheathing, Exp 1 or Ext.
- 2.6 Subflooring shall be of either plywood, structural use panels, or wood.



- 2.6.1 Plywood shall conform to Product Standard PS I; Grade C-D for uses not otherwise specified, Grade C-D with exterior glue for reception of underlayment as wood flooring, underlayment grade with exterior glue or C-C (Plugged), and exterior grade for use as a combination subfloor-underlayment under resilient flooring.
- 2.6.2 Structural-Use Panels shall be APA Rated structural-use panels qualified for subflooring or combination subfloor-underlayment under APA Performance Standards and Policies for Structural-Use Panels.
- 2.6.3 Wood shall be center-matched, ship-lapped, or square-edge. Species and grade shall be in accordance with Table 1 at the end of this section.
- 2.6.4 Adhesive shall conform to APA Specification AFG-01.
- 2.7 Underlayment shall be either hardboard, particleboard, or plywood.
- 2.7.1 Hardboard shall be in accordance with ANSI A135.4, service class, sanded on one side, 1/4 inch thick and 4 feet wide.
- 2.7.2 Particleboard shall be in accordance with ANSI A 208.1, Grade I-M-I, 1/4-inch thick, and 4 feet by 4 feet.
- 2.7.3 Plywood shall be in accordance with Product Standard PS 1, underlayment grade with exterior glue, or C-C (Plugged) exterior grade, 3/8-inch thick and 4 feet wide.
- 2.8 Moisture Barrier of building paper shall conform to Fed. Spec. UU-B-790, Type I, Grade D, style optional; or shall be asphalt-saturated felt conforming to ASTM D 226, Type I. Polyethylene sheeting shall conform to ASTM D 2103, 4 mil thick.
- 3.0 EXECUTION:
- 3.1 Nailing shall be in accordance with the Recommended Nailing Schedule as contained in NFPA Manual for House Framing.
- 3.2 Sheathing Installation
- 3.2.1 Fiberboard sheathing shall be applied with edges 1/8 inch apart; at joints, fitted snugly at abutting frames of openings, and nailed or stapled. Sheets 2 feet wide shall be applied horizontally with the tongued groove up and with vertical joints over supports and staggered. Sheets 4 feet wide shall be applied vertically, extended over top and bottom plates, and with all vertical and horizontal joints over supports.
- 3.2.2 Gypsum Board Sheathing shall be applied with edges in light contact at joints and nailed. Sheets 2 feet wide shall be applied horizontally with tongued edge up and with vertical joints over supports and staggered. Sheets 4 feet wide sheet be applied vertically, extended over top and bottom plates, and with all vertical and horizontal joints over supports.
- 3.2.3 Plywood Sheathing shall be applied with edges 1/8 inch apart at side joints, 1/16 inch apart at end joints, and nailed at supported edges at 6 inches on center and at intermediate supports 12 inches on center. Nailing of edges shall be 3/8 inch from the edges. Wall sheathing shall extend over top and bottom plates. If applied horizontally, the vertical joints shall be made over supports and staggered. Wall sheathing over which wood shingles are to be applied shall be applied horizontally. Roof sheathing shall have face grain at right angles to supports with end joints made over supports and staggered.



## 06000 - Wood & Plastic

- 3.2.4 Structural-Use Panels shall be applied with edges 1/4 inch apart at side joints, 1/8 inch apart at end joints, and nailed at supported edges at 6 inches on center and at intermediate supports 12 inches on center. Nailing of edges shall be 3/8 inch from the edges. Wall sheathing shall extend over top and bottom plates and, if applied horizontally, the vertical joints shall be made over supports and staggered. Wall sheathing over which wood shingles are to be applied shall be applied horizontally. Roof sheathing shall have end joints made over supports and staggered.
- 3.2.5 Wood Sheathing: End joints shall be made over framing members and so alternated that there will be at least two boards between joints on the same support. Each board shall bear on at least three supports. Boards shall be nailed at each support using two nails for boards 8 inches and less in width and three nails for boards more than 8 inches in width.
- 3.3 Subflooring Installation: A clearance of 1/4 inch shall be provided at walls. Plywood subflooring and structural-use panel subflooring shall be installed with adhesive and nails spaced at 12 inches on center. Installation of subflooring with adhesives shall be in accordance with APA Design/Construction Guide: Residential and Commercial. Each plywood or structural-use panel shall have end joints made over supports and staggered. Where finish flooring of different thickness' is used in adjoining areas, wood strips of the thickness required to bring the finish flooring surfaces to the same plane shall be used under the subfloor panels. Plywood subflooring shall be applied with the face grain at right angles to the supports, with edges 1/8 inch apart at side joints and 1/16 inch apart at end joints. Structural-use panel subflooring shall be applied over two or more supports with the long dimension across supports and with edges 1/4 inch apart at side joints and 1/8 inch apart at end joints. Wood subflooring shall bear on at least three supports.
- 3.4 Installation of Underlayment shall be applied with edges 1/32 inch apart at joints and a clearance of 1/4 inch at walls joints at underlayment shall not be located directly over parallel joints at subflooring. Power driven wire staples of lengths recommended by the underlayment manufacturer may be used in lieu of nails. Any surface roughness at nail heads or joints shall be lightly sanded to blend with the undisturbed surface. When plywood combination subfloor-underlayment is used in lieu of separate layers, it shall be installed as specified for plywood subfloor, except all joints shall be made over supports with edge joints spaced 1/8 inch apart and end joints spaced 1/16 inch apart. When plywood combination subfloor-underlayment is tongued and grooved, only end joints shall require support. Tongued and grooved combination subfloor-underlayment shall be applied with joints spaced 3/32 inch apart.
- 3.5 Installation of Shear Wall Plywood or structural-use panels shall be installed with the long dimension parallel or perpendicular to the supports. Blocking shall be provided behind edges not located over supports.
- 3.6 Moisture Barrier shall be applied over all wood wall sheathing, over studs to directly receive horizontal siding or board siding, over any wall sheathing to receive an unbacked stucco base, and over square edge wood subflooring to receive wood strip flooring. Moisture barrier over sheathing shall be applied horizontally, starting at the bottom, lapped 6 inches at edges and ends, and nailed at laps 16 inches on center. Moisture barrier over subfloor shall be applied as the strip flooring installation progresses and lapped 2 inches at edges and ends.



TABLE 1  
SPECIES AND GRADE  
Subflooring, Roof Sheathing, Wall Sheathing, Furring

Grading Rules	Const Species	No 2 Standard	No. 2 Comm	No. 3 Board	Comm	Comm
NHLA	Cypress				X	
NELMA	Northern White Cedar					X
	Eastern White Pine	X				
	Northern Pine	X				
	Balsam Fir					X
	Eastern Hemlock-					X
	Tamarack					
NHPMA	Eastern White Pine					X
	Northern Pine					X
	Balsam Fir					X
	Eastern Hemlock-					X
	Tamarack					
RIS	Redwood		X			
SCMA	Cypress				X	
SPIB	Southern Pine			X		
WCLB	Douglas Fir-Larch	X				
	Hem-Fir	X				
	Sitka Spruce	X				
	Mountain Hemlock	X				
	Western Cedar	X				
WWPA	Douglas Fir-Larch					X
	Hem-Fir					X
	Idaho White Pine					X
	Lodgepole Pine					X
	Ponderosa Pine					X
	Sugar Pine					X
	Englemann Spruce					X
	Douglas Fir South					X
	Mountain Hemlock					X
	Subalpine Fir					X
	Western Cedar					X

END OF SECTION 06113



## SECTION 06181

### GLUE LAMINATED STRUCTURAL UNITS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for maintenance and repair of Heavy Timber Construction. These products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS
  - 2.1 Structural Glue-Laminated Timber shall comply with Product Standard PS56. Lumber for laminating shall be of a stress grade providing glue-laminated members with allowable stress values of 2,000 psi in bending, 1,600 psi in tension, 1,500 psi in compression parallel to grain, and 385 psi in compression perpendicular to grain for dry condition of service.
    - 2.1.1 Adhesives shall meet requirements for dry condition of service.
    - 2.1.2 Appearance of Members shall be Industrial Grade. Plywood shall comply with Product Standard PSI.
    - 2.1.3 Surfaces of Members shall be sealed with a penetrating sealer. Members shall be delivered individually wrapped. Do not unwrap until members are installed and adequate protection is provided.
  - 2.2 Timber Connections
    - 2.2.1 Split-Ring Connectors shall be SAE 1010 hot-rolled carbon steel. Rings shall be of standard manufacture and shall fit snugly into pre-cut groove.
    - 2.2.2 Shear Plate:
      - 2.2.2.1 Pressed Steel Type shall be SAE 1010 hot-rolled carbon steel. Shear plates shall be of standard manufacture.
      - 2.2.2.2 Malleable Iron Type: Casting shall comply with ASTM A47, Grade 35018. Casting shall be of standard manufacture.
  - 2.3 Fasteners
    - 2.3.1 Nails: Industrial Grade
    - 2.3.2 Anchor Bolts, Lag Bolts, and Miscellaneous Bolts and Screws: ASTM A 307. Type, size, and finish shall be best suited for the intended use.
  - 2.4 Sawn Lumber
    - 2.4.1 Lumber shall be one of the following species and commercial grades:
      - 2.4.1.1 Douglas Fir or Larch: Select structural (1500 f) or better.
      - 2.4.1.2 Southern Pine: No. 1 (1500 f) or better.
      - 2.4.1.3 Western Hemlock: Select structural (1500 f) or better.





- 2.4.2 Sizes, Grading and Marking shall comply with PS20, and unless otherwise indicated, lumber shall be surfaced on four sides. Dressed sizes shall be accepted as the minimum net sizes conforming to nominal sizes. Lumber shall be free from warp. All timber materials shall bear a grademark or other identifying marks indicating grades of material and standards under which produced. If lumber is treated, treatment and retention shall be indicated.
- 2.5 Preservative Treatment: All lumber shall be preservative-treated unless otherwise indicated. Pressure treat with water borne salt preservative. The retention shall be a minimum of 0.25 pounds per cubic foot. Treatment shall comply with AWPB. Give all cuts and abrasions 2 brush coats of the same preservative as used at the factory.
- 2.6 Moisture Content: The moisture content of wood shall not exceed 15 percent at the time of treatment or installation.
- 3.0 EXECUTION
- 3.1 Wiring Conflicts: Piping and electrical wiring conflicting with erection of members shall be removed and placed in a new position approved by the Contracting Officer. Provide temporary utilities and coordination to prevent outages during this period.
- 3.2 Connections: Drive nails and spikes with just sufficient force to set the heads flush with the surface of the wood. Drill bolt holes a maximum of 1/16 inch larger than the diameter of the bolt. A washer not less than a standard cut washer, or in lieu thereof a metal plate or strap, shall be between the wood and the bolt head and between the wood and the nut. Lag screw holes for the unthreaded portion of the shank shall be the same diameter as the shank and the same depth as the length of the unthreaded shank. The lead hole for the threaded portion of the shank shall be properly sized for species of lumber involved. Insert the threaded portion of the lag screw into its lead hole by turning with a wrench.
- 3.2.1 Nails: Use 8-penny or larger nails for nailing through 1-inch thick lumber and for toe nailing 2-inch thick lumber; use 16-penny or larger nails for nailing through 2-inch thick lumber. Size and spacing of nails shall comply with NFPA Specification for Stress-Graded Lumber and Its Fastenings.
- 3.2.2 Wood Screws: Lead holes for withdrawal resistance shall have a diameter of 70 percent of the root diameter of the wood screw. Lead holes for lateral resistance shall have a diameter of 7/8 of the root diameter of the wood screw. The part of the hole receiving the shank shall be about 7/8 the shank diameter. Insert screws in the lead holes by turning with a screwdriver or other tool.
- 3.2.3 Timber Connections: Install the split ring and shear plate in grooves cut by the Contractor.
- 3.3 Truss Connections and Splices: Tighten all loose bolts and screws, adding washers as required. Remove severely corroded or deteriorated bolts and screws and replace with new.
- 3.4 Repair of Bearings and Anchor Bolts: Remove corrosion by wire brushing, sanding, or other approved method. Additional repair requirements shall be as directed.
- 3.5 Repair of Excessive Truss Deflection: Install tension turnbuckles or install a strengthening system as required to correct deflection.

END OF SECTION 06181



## SECTION 06200

### FINISH CARPENTRY

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installing of millwork. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

1.1 General Workmanship

Fabricate and install work as indicated or specified. Finished work shall be free from open joints, warps, splits and other defects that impair service ability or mar appearance. All members and panels shall be one piece where stock sizes permit. No splices in jambs, stiles, and rails and similar members except where called for in design. All joints tight and neat, M & T or T & G, glued. Tenons and dowels a driving fit; sizes as required to provide joints with maximum possible strength. Glue all joints and meeting surfaces thoroughly. Fabricate work for accurate fit with edges, corners, arises and joints straight and true and with adjoining surfaces in the same plane absolutely flush. Countersink and plug or putty stop screw heads on exposed surfaces. Where nailing is required on exposed surfaces, use finishing nails and set and putty stop. Exposed surfaces shall have a fine, smooth finish free from tool mark, machine marks, raised grain or other defects.

2.0 PRODUCTS

2.1 General: All millwork products shall be marked with manufacturer's identification and grade, in compliance with Architectural Woodwork Institute (AWI) quality grade. Products shall conform to applicable requirements of AWI Quality Standards and Manual of Millwork.

2.2 Millwork: Millwork shall include the following representative examples of architectural woodwork:

- a. Exterior cornices, facias, and soffits.
- b. Trim for exterior and interior openings; birch.
- c. Frames for exterior and interior doors and other openings.
- d. Casework.
- e. Wood shelving.
- f. Chair rails; birch with continuous kerfing where required.
- g. Door holder blocks.
- h. Convactor enclosures.
- i. Wall seats; straight grain birch, poplar, or white wood.
- j. Hook ladders; straight grained oak.
- k. Exercise/Dance Barre; oak.



- 2.3 Wood Moisture Content: Lumber for millwork shall be kiln-dried to an average moisture content range of 9 percent to 13 percent for exterior work and 6 percent to 11 percent for interior work.
- 2.4 Grade of Work: Interior millwork surfaces that are to receive transparent finishes shall be premium grade of the species selected. Millwork surfaces that are to be painted shall be custom grade of the species selected.
- 2.5 Fire-Retardant Marking: Each unit of fire-retardant treated wood and plywood shall be marked with the producer's label and UL label showing grade and rating.
- 2.6 Preservative Treatment: Exterior millwork and designated interior millwork shall be preservative-treated in accordance with NWMA I.S.4. Use a preservative that will not interfere with the designated finish. Apply brush coat on surfaces cut after treatment.
- 3.0 EXECUTION
- Millwork shall be installed plumb, level, true, and straight with no distortions. Millwork that abuts adjoining work shall be scribed and cut to fit. Millwork shall be installed with a minimum number of joints, coped at returns, mitered at corners, and shall comply with quality standards for joinery.
- 3.1 Delivery and Storage: Do not deliver materials and millwork until all work necessary to receive installation has been completed and plaster and grounds are dry. Kiln dry all finished woodwork to a moisture content of not more than 10% and deliver to building in this condition. Protect materials and millwork from dampness both during and after delivery. Store in designated rooms and spaces only. Pile carefully to lie flat, straight and out of wind. Ventilate storage areas and protect materials from all damage.
- 3.2 Gluing: Prepare surfaces, mix and apply glue in accordance with manufacturer's directions for the type of work. Do not apply glue when temperature is below 70 degrees F. Make all mating surfaces tight fitting. Dry surfaces to a moisture content of between 8 and 12 percent and remove all grease, dirt and other foreign material before applying glue. Spread glue uniformly over entire surface with brush or other tool recommended by manufacturer for the type of work. Apply pressure while glue is still fluid and retain pressure until glue has thoroughly set.
- 3.3 Pegboards: Before working, condition boards to minimize swelling due to air moisture as recommended by manufacturer. Cut edges true and square and sand smooth. Pre-drill and countersink screw holes. Putty stop screw heads. Install board in one piece where stock size panels permit. No vertical joints in boards 8 ft. or less in length and no horizontal joints less than 5 ft above bottom board. Protect face from scratches and other damage.

END OF SECTION 06200



## SECTION 06410

### CABINETS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of cabinets. Products shall match existing materials or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

All work fabricated as indicated and specified and in accordance with best practices of cabinetmaking trade for institutional quality furnishings; product of not more than one manufacturer and/or one independent mill; prefinished at place of manufacture. Joints tight and neat; mortise and tenon (M&T), tongue and groove (T&G), dadoed, or rabbeted; glued; reinforced with concealed dowels, screws, glue blocks or braces; all as indicated or specified and in accordance with best practices. Tenons and dowels a driving fit. Glue blocks screwed in place. Edging strips T & G to parent parts. Shelves notched neatly beyond ends of grooves; terminate shelf grooves 1" back from ends of panels. Edges, corners and joints, straight and true. Exposed surfaces to receive natural finish, smooth, even and free of tool and machine marks.

#### 2.0 PRODUCTS

- 2.1 Cabinets shall comply with ANSI A161.1.

- 2.2 Countertops shall comply with ANSI A161.2.

#### 2.3 Materials

- 2.3.1 Particleboard shall comply with ANSI A208.1 mat-formed particleboard, Grade I-M-2 with minimum density of 20 lbs/cu ft, internal bond of 60 psi; and minimum screwholding capacity of 225 lbs on faces and 200 lbs on edges.

- 2.3.2 Plastic Laminate shall comply with NEMA LD-3.

- 2.3.2.1 Decorative Plastic Laminate Surfacing: Equal to Formica, Micarta or Panelite and complying with standards for high pressure plastic laminates. Thickness: 1/16". Satin finish; linen texture. Color as selected by the Contracting Officer. Submit samples and manufacturer's printed descriptive literature installation instructions approval. Use of plastic laminate backing sheet shall be as recommended by manufacturer of plastic laminate.

- 2.3.3 Hardwood Plywood shall be PS 51, ANSI A99.1, Good Grade (1) or better.

- 2.3.4 Hardwood Lumber shall be clear, dry, sound, and free of defects, First Grade Lumber (NHLLA).

- 2.3.5 Hardboard shall be ANSI A135.4, Class 1, tempered.

- 2.3.6 Decorative Boards shall be low pressure melamine plastic laminate composite panels complying with NEMA LQ 1.

- 2.3.7 Medium Density Fiberboard shall be ANSI A208.2.



- 2.3.8 Wood Glue
- 2.3.9 Schedule of Parts: Except where otherwise specified, fabricate the various parts of cabinetwork of the following materials:
  - 2.3.9.1 Frames and Edging: Solid hardwood lumber. One-piece strips for full length and width of straight runs.
  - 2.3.9.2 Tops: Where surfaced with plastic laminate, particleboard; elsewhere, plywood.
  - 2.3.9.3 Sides and Bottoms: Plywood. On trucks, use particleboard core plywood.
  - 2.3.9.4 Backs: As hereinafter specified.
  - 2.3.9.5 Shelves: Solid hardwood lumber. On trucks, use hardwood.
  - 2.3.9.6 Dividing Partitions: Hardwood.
  - 2.3.9.7 Doors: As hereinafter specified.
  - 2.3.9.8 Drawers: Solid lumber.
  - 2.3.9.9 Base Boards: Solid lumber.
- 2.4 Transparent Finish Construction
  - 2.4.1 Solid Lumber and Plywood Face Veneer shall be selected for compatible grain and color of the species.
  - 2.4.2 Semi-Exposed Materials:
    - 2.4.2.1 Solid Lumber: Dry, sound, selected to eliminate appearance defects, of any species of hardwood or softwood, with color and grain characteristics similar to exposed portions.
    - 2.4.2.2 Plywood: Species to match color and grain of exposed members; with particleboard core or veneer core.
  - 2.4.3 Style of Face Construction: Provide base, wall, and full height units with drawer fronts, doors, and fixed panels overlaying and concealing face frames of cabinet body, as required.
  - 2.4.4 Face Frame Style: Provide base, wall, and full height units with face frames of cabinets exposed around drawer fronts and doors.
    - 2.4.4.1 Drawer Fronts and Doors: Surface applied or recessed flush with cabinet front, as required.
    - 2.4.4.2 Flush Type Door Construction: Lumber core plywood, 5-ply with hardwood face veneers and crossbanding.
    - 2.4.4.3 Flush Type Drawer Fronts: Same construction as door, or solid or glued-up lumber, not less than 1/2 inch thick.
    - 2.4.4.4 Stile and Rail Drawer Fronts and Doors: Of design selected, with stiles and rails of solid lumber, 3/4 inch thick for doors and 5/8 inch thick for drawer fronts.
- 2.5 Countertop Construction



## 06000 - Wood & Plastic

- 2.5.1 Exposed Surfacing Material: High pressure plastic laminate, 0.050 inch thick, general purpose type (GP50); except where postformed countertop configuration is required, when 0.042 inch thick, postforming type (PF42) shall be used.
- 2.5.2 Substrate (Core) for Exposed Surfacing Material: Particleboard.
- 2.5.3 Countertop Configuration: Provide countertops with front styles (nose), cove, and backsplash style, as required.
- 2.5.4 Countertop Thickness: Not less than 1-1/2 inches with substrate (core) not less than 3/4 inch thick.
- 2.6 Cabinet Hardware: ANSI A156.9.
- 2.7 Accessories: Provide designated accessories.
- 2.8 Auditorium Stair Treads and Risers: Oak, hand sanded; tongue and groove construction, housed in stringers, securely wedged and glued.
- 3.0 EXECUTION
- 3.1 Gluing: Prepare surfaces, mix and apply glue in accord with manufacturer's directions for type of work. Do not apply glue when temperature is below 70° degrees F. All mating surfaces shall be tight fitting. Dry wood to a moisture content between 8 and 12 percent and glue uniformly over entire surfaces with brush or other tool recommended for this type of work. Apply pressure while glue is fluid and maintain pressure until glue has thoroughly set.
- 3.2 Application of Decorative Plastic Laminate
  - a. Preparation: Remove all grease, oil, dirt and other foreign materials from base surfaces. Sand all base surfaces to a smooth, level surface, free from all irregularities. Remove all sanding dust.
  - b. Fitting: Cut and prefit laminate sheets before cementing. No longitudinal seams. Cross seams only as hereinafter specified. Cut edges of laminate shall be joined true and parallel with slight bevel so sharp edge is on face side. Check edges for contact and flush fit throughout and adjust as required to obtain this fit. Size cut edges with a thin coat of contact cement.
  - c. Bonding Laminate: Surfaces shall be dry when contact cement is applied. Completely cover both surfaces to be bonded. Follow manufacturer's recommendations. Allow cement to dry thoroughly between coat and before applying laminate. Position laminate and apply pressure. Remove all excess cement. Trim edges and apply stainless steel edging strips.
- 3.3 Installation of Hardboard: Before working, condition hardboard to minimize swelling due to air moisture as recommended by Manufacturer. Cut hard board true and square; sand edges smooth. Allow 1/16" clearance all around for movement. Nail at 4" intervals along all edges and at 6" intervals along intermediate supports. Use 5d casing nails. Do not nail closer than 1/4" to hardboard edges. Do not toenail. Drill holes for all screws; countersink screws and putty stop. Install hardboard in one piece where stock size of panels permit. Protect panel faces from scratches and other damage. Sand sill tracks of sliding hardboard doors smooth and wax or apply other friction reducing compound manufactured for this purpose.

END OF SECTION 06410



## SECTION 06420

### WOOD PANELING

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of wood paneling. Products shall match existing materials or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS
  - 2.1 General: Paneling shall bear a stamp, brand, or other identifying mark indicating quality, construction and compliance with the grading rules of the respective grading and inspecting agency for the species and product indicated. Marking shall be placed on blind sides only.
  - 2.2 Plywood Paneling shall be of softwood or hardwood veneers, as designated. Plywood shall comply with PS 1 and ANSI A 199.1. Hardwood plywood shall comply with PS 51.
  - 2.3 Board Type Paneling shall be of softwood or hardwood, as designated. Softwood shall comply with PS 20. Hardwood shall comply with National Hardwood Lumber Association rules.
- 3.0 EXECUTION
  - 3.1 Preparation: Backprime material when exposed to moisture and high relative humidity.
  - 3.2 Installation
    - 3.2.1 Plywood Paneling: Where grain character or color variations are noticeable, select and arrange panels on each wall for best match of adjacent panels. Install with uniform tight joints between panels. Attach panels to supports with panel adhesive plus nailing where covered by moldings for concealed fastener installation. Arrange panels with v-grooves and joints over supports, and nail fasteners with prefinished heads selected to match v-groove color.
    - 3.2.2 Board Type Paneling: Arrange in random-width pattern unless boards are of uniform width. Stagger end joints in random pattern uniformly distributed on each wall. Where grain character and color of boards vary noticeably, select and arrange boards for best visual effect.

END OF SECTION 06420

END OF SPECIFICATION SECTION 06 – Woods & Plastics



06000 - Wood & Plastic

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## SECTION 07112a

### BITUMINOUS WATERPROOFING

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of bituminous waterproofing. Products shall match existing materials and/or shall be as directed the Contracting Officer. Installation procedures shall be in accordance with the product manufacturers recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
  - 2.1 Asphalt Waterproofing:
    - 2.1.1 Primer: Asphalt waterproofing material shall comply with ASTM D.41-41.
    - 2.1.2 Bitumen: A heavy-bodied bituminous compound of trowel consistency, heavily reinforced with fiber, complying with ASTM D 173.
  - 2.2 Tar Waterproofing:
    - 2.2.1 Primer: Creosote complying with ASTM D 43.
    - 2.2.2 Bitumen: Coal-Tar Pitch complying with ASTM D 450.
- 3.0 EXECUTION:
  - 3.1 Installation:
    - 3.1.1 Primer:
      - 3.1.1.1 Diluted Asphalt: Apply by brush or power spray in a continuous unbroken film, free from pinholes or other surface breaks.
      - 3.1.1.2 Creosote: Apply by brush, roller, or power spray.
    - 3.1.2 Bitumen and Membrane:
      - 3.1.2.1 Reinforce all inside and outside corners, joints, cracks, or places where stresses are likely to occur, with no less than two piles of fabric in alternate coats of bitumen.
      - 3.1.2.2 All penetrations through the wall such as pipes, conduits, etc., shall be sealed with two additional plies.
      - 3.1.2.3 Apply the specified number of plies of membrane material in alternate coats of bitumen.
      - 3.1.2.4 For vertical applications, secure membranes near the top of each course.
      - 3.1.2.5 Coat last ply of membrane with a thorough coat of bitumen.
  - 3.2 Protection: As the membrane is completed, apply the protection course. Apply the protection board in a solid coating of asphalt or coal-tar pitch. All coatings must be dry before application of the protection board. Apply protection board by the lap method (lap each sheet 6 inches preceding



## 07000 - Thermal & Moisture Protection

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sheet) or by the batten method (but each sheet then apply a 6-inch strip of protection board in adhesive over all joints).

END OF SECTION 07112a



## SECTION 07112b

### BITUMINOUS MEMBRANE WATERPROOFING

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of bituminous membrane waterproofing. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation and surface preparation procedures shall be in accordance with the product manufacturers recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
  - 2.1 Asphalt Membrane Waterproofing:
    - 2.1.1 Primer: Asphalt waterproofing compound complying with ASTM D.41-41 or BSA MEA approval.
    - 2.1.2 Joint Covering: Asphalt saturated felt, complying with ASTM D.250.
    - 2.1.3 Membrane: Burlap fabric, complying with ASTM D 1327; open mesh fiberglass, smooth, evenly woven to permit complete penetration of asphalt compound complying with ASTM D 1668, Type I; or asphalt-coated or saturated felt, complying with ASTM D 250.
    - 2.1.4 Bitumen: A heavy-bodied bituminous compound of trowel consistence complying with ASTM D 173.
    - 2.1.5 Protection: A rigid or semi-rigid board for protection of membrane waterproofing from penetration by sharp objects during backfilling and later settlement. The board shall be an asphaltic core board or asphalt-saturated fiberboard complying with ASTM C 208. Thickness shall be 1/8 inch minimum.
  - 2.2 Tar Membrane Waterproofing:
    - 2.2.1 Primer: Creosote complying with ASTM D 43.
    - 2.2.2 Joint Covering: Coal-tar saturated felt, complying with ASTM D 227.
    - 2.2.3 Membrane: Burlap fabric complying with ASTM D 1327; open mesh-fiberglass smooth, evenly woven to permit complete penetration of coal-tar compound; or coal-tar coated or saturated felt.
    - 2.2.4 Bitumen: Coal-tar pitch complying with ASTM D 450.
    - 2.2.5 Protection: A rigid or semi-rigid board for protection of membrane waterproofing from penetration by sharp objects during backfilling and later settlement shall be provided. The board shall be an asphaltic board or asphalt saturated fiberboard. If used with coal-tar products, the board shall be faced with a polyethylene film to separate dissimilar materials. Thickness shall be 1/8 inch minimum
- 3.0 EXECUTION:
  - 3.1 Installation:
    - 3.1.1 Primer:



## 07000 - Thermal & Moisture Protection

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- 3.1.1.1 Diluted Asphalt: Apply by brush or power spray in a continuous unbroken film, free from pinholes or other surface breaks.
- 3.1.1.2 Creosote: Apply by brush, roller, or power spray.
- 3.1.2 Bitumen and Membrane:
  - 3.1.2.1 Reinforce all inside and outside corners, joints, cracks, or places where stresses are likely to occur, with no less than two piles of fabric in alternate coats of bitumen.
  - 3.1.2.2 All penetrations through the wall such as pipes, conduits, etc., shall be sealed with two additional plies of membrane.
  - 3.1.2.3 Apply the specified number of plies of membrane material in alternate coats of bitumen.
  - 3.1.2.4 For vertical applications, secure membranes near the top of each course.
  - 3.1.2.5 Coat last ply of membrane with a thorough coat of bitumen.
- 3.2 Protection: As the membrane is completed, apply the protection course. Apply the protection board in a solid coating of asphalt or coal-tar pitch. All coatings must be dry before application of the protection board. Apply protection board by the lap method (lap each sheet 6 inches preceding sheet) or by the batten method (butt each sheet then apply a 6-inch strip of protection board in adhesive over all joints).

END OF SECTION 07112b



## SECTION 07113

### PLASTIC / RUBBER SHEET WATERPROOFING

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of plastic sheet waterproofing. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation and surface preparation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
  - 2.1 Butyl Sheet shall be an impermeable butyl rubber membrane 1/16 inch thick having a tensile strength of 1,200 psi minimum, complying with ASTM D 412, and an elongation of 300 percent minimum, complying with ASTM D. 412, Butyl sheet shall be resistant to ozone and remain flexible to 40 F below zero.
  - 2.2 Neoprene Sheet shall be an impermeable, self-extinguishing, ozone-resistant material 1/16 inch thick. Neoprene shall have a tensile strength of 1,500 psi minimum, complying with ASTM D 412, and an elongation of 250 percent minimum, complying with ASTM D 412.
  - 2.3 Ethylene Propylene Diene Monomers (EPDM) Sheet shall be an impermeable membrane resistant to ozone and ultraviolet. EPDM shall have a tensile strength of 1,400 psi minimum, complying with ASTM D 412, and an elongation of 300 percent minimum, complying with ASTM D 412.
  - 2.4 Vinyl Sheet shall be heavy-duty polyvinyl chloride sheet, complying with ASTM D 3083.
  - 2.5 Primers: As per manufacturer's recommendations.
  - 2.6 Adhesives:
    - 2.6.1 Adhesive for Cold Application shall be a non-setting bitumen cut-back asphalt.
    - 2.6.2 Adhesive for Hot Application shall be asphalt complying with ASTM D 312, Type III.
  - 2.7 Butt Joint Tape: Elastomeric vapor barrier in 6-inch wide rolls. Tape shall be self-adhesive and require no additional adhesive.
- 3.0 EXECUTION:
  - 3.1 Primer: Apply primer by brushing or spraying uniformly over surface to receive membrane. Allow primer to dry before applying membrane.
  - 3.2 Membrane:
    - 3.2.1 At Footings, shape the membrane to conform to the surface by cutting a strip of sufficient width to seat over the footing and at least six inches up the wall.
    - 3.2.2 On Vertical Surfaces, apply adhesive to both walls and membrane.

END OF SECTION 07113



## 07000 - Thermal & Moisture Protection

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### SECTION 07121

#### FLUID-APPLIED WATERPROOFING

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of fluid-applied waterproofing. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation and surface preparation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
- 2.1 Two-Component Polyurethane: Two component, self-curing urethane system to form a seamless, permanently flexible and waterproof coating. Compound shall be a light-weight, 99 percent solids, liquid-applied system.
- 2.2 Single Component Polyurethane: One-part moisture cured elastomeric urethane for adhesion to concrete or wood. Compound shall be hard, flexible material with resistance to weather, gas, oil, and salt water having a temperature range of -65 F to +200 F.
- 2.3 Two-Component Polyurethane Rubber Base: Liquid-applied, elastomeric two component urethane rubber, 100 percent solids materials containing no coal-tar or asphaltic extenders. After proper mixing, with activators that are supplied as a unit, it shall cure to an elastomeric urethane rubber.
- 2.4 Two-Component Polysulfide Base Liquid Polymer: Two-component, chemically-curing, high-solids compound containing liquid polysulfide polymer. Product shall be furnished in two components: Part 1, consisting of the cure agent and suitable reinforcing agents; Part 2, the base component, incorporating liquid polysulfide polymer.
- 2.5 Modified Polyurethane Coal-Tar (Spray Grade): Two-part product, consisting of: Part 1, a blend of polyurethane resins, and Part 2, containing a selected blend of coal-tars, catalysts, and modifiers. The cured membrane shall be a seamless, low modulus, high elongation, physically and chemically resistant synthetic rubber.
- 2.6 Modified Polyurethane Coal-Tar (Trowel Grade): One component polyurethane coal-tar modified compound that forms a continuous seam-less, flexible, impervious membrane when applied to vertical or horizontal surfaces.
- 2.7 Elastomeric Sheet Reinforcing: Smooth, evenly woven, open mesh glass fiber fabric weighing 1/4 ounce per square foot and which permits complete penetration of waterproofing compounds.
- 2.8 Protection Board: Rigid or semi-rigid board for protection of membrane waterproofing shall be an asphaltic core board or an asphaltic saturated fiberboard complying with ASTM C 208. Protection board shall be 1/8 inch thick. If used with coal-tar products, the board shall be faced with a polyethylene film to separate dissimilar materials.
- 3.0 EXECUTION:
- 3.1 Two-Component Polyurethane:



## 07000 - Thermal & Moisture Protection

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- 3.1.1. Prime surfaces as required.
- 3.1.2. Spray machine mixed membrane coating directly onto the prepared surfaces to the desired thickness.
- 3.1.3. Apply the second spray coat after application of the first coat.
- 3.2. Single Component Polyurethane:
  - 3.2.1. Prime surfaces as required.
  - 3.2.2. Application shall be spray-applied.
  - 3.2.3. Below grade exterior applications shall receive two coats.
- 3.3. Two-Component Polyurethane Rubber Base:
  - 3.3.1. Prime surfaces as required.
  - 3.3.2. Apply compound by hand trowel to a thickness of 1/16 inch.
  - 3.3.3. Before membrane is completely cured, place protection board over the surface.
- 3.4. Two-Component Polysulfide Base Liquid Polymer:
  - 3.4.1. Fill all joints and cracks over 1/8 inch in width with a polysulfide polymer base sealant. Apply a bond breaker over the joint and cover with 100 mil coating of the elastomeric material.
  - 3.4.2. Apply membrane by spray in a continuous unbroken film. Surface coverage shall be at the rate of approximately 20-25 square feet per gallon to produce a thickness of 60 mils.
- 3.5. Modified Polyurethane Coal-Tar (Spray Grade):
  - 3.5.1. Prime surfaces with required primer.
  - 3.5.2. Apply with proper spray equipment in a continuous unbroken film. Application rate shall be approximately 25 sq. ft. per gallon produce a thickness of 60 mils.
- 3.6. Modified Polyurethane Coal-Tar (Trowel Grade):
  - 3.6.1. Prime surfaces with required primer.
  - 3.6.2. Mix and apply with hand trowel in a continuous unbroken film.
  - 3.6.3. Place protection board after membrane has attained its initial set.
- 3.7. Elastomeric Sheet Reinforcing for Fluid-Applied Waterproofing: Trowel fabric into first coat of membrane while membrane material is soft and pliable. Install sheet reinforcing in compliance with membrane compound manufacturer's requirements.
- 3.8. Protection Board:
  - 3.8.1. Apply protection board over membrane while membrane material is still tacky.
  - 3.8.2. Apply protection board by the lap method.

END OF SECTION 07121



## 07000 - Thermal & Moisture Protection

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### SECTION 07130

#### BENTONITE CLAY WATERPROOFING

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of bentonite clay waterproofing. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation and surface preparation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
  - 2.1 Preformed Bentonite Clay Panels and Tubes:
    - 2.1.1 Panels shall be made of dry bentonite granules packed into the corrugated flutes of biodegradable kraft boards. Panels shall be four feet square by 3/16 inch thick and weigh 18 pounds.
    - 2.1.2 Tubes shall be a water soluble polyvinyl alcohol container filled with dry granular bentonite and hermetically sealed. Tubes shall be two-inch diameter by two-foot lengths and weigh approximately three pounds.
  - 2.2 Bentonite Gel: Clay composition of hydrated aluminum silicate, which swells upon absorption of water into a thick gel. .
  - 2.3 Joint Seal: A hydrated bentonite gel for trowel application to concrete for sealing construction joints, form tie voids, and wall penetrations.
  - 2.4 Joint-Pak Containers: A biodegradable kraft container filled with dry bentonite granules for preformed concrete joints in below grade foundation walls. Standard joint-paks shall be 1-1/4 x 1-1/4 inches, weighing approximately 1.1 pounds. Provide triangular-shaped cross section 2-3/8 x 2-3/8 x 2-3/8 inches x 2 feet long, weighing approximately 3 pounds for inside corner joints.
  - 2.5 Chemically Modified Bentonite For Spray Application: High pressure spray combining bentonite clay with a modified asphalt binder that adheres the bentonite to vertical surfaces. Clay content shall be 1-1/9 pounds per square foot.
  - 2.6 Moisture Barrier: 4 mil polyethylene sheeting complying with ASTM D 2103.
  - 2.7 Protection Board: Multi-ply, semi-rigid board composed of a mineral fortified asphaltic core between a layer of asphalt saturated liner and a weathercoated glass mat liner with polyethylene film facing. Protection board shall be 4 feet by 8 feet by 1/8 inch.
  - 2.8 Masonry Nails: 2-inch minimum by No. 9 fluted masonry nails with 1-inch minimum diameter disks for fastening panels to concrete and masonry walls.
- 3.0 EXECUTION:
  - 3.1 Maintenance and Repair Methods:
    - 3.1.1 Preformed Bentonite Panels:





## 07000 - Thermal & Moisture Protection

- 3.1.1.1 Prior to installation of panels, parge all joints and cracks with joint seal to 1/8-inch minimum depth and 7-inch minimum width. Apply panels with masonry nails, joint seal, of approved mastic. Fold and attach panels around corners with corrugations horizontal. Lap all adjoining panel edges 1 1/2 inches and stagger vertical joints of succeeding courses.
- 3.1.1.2 Install polyethylene sheeting immediately after panels are installed to provide temporary protection to bentonite panels against moisture. Overlap sheeting four inches. Apply sheeting with adhesive.
- 3.1.1.3 Install protection board with the asphalt-saturated felt face against the waterproofing for protection from damage by maintenance and repair activities including backfilling.
- 3.1.1.4 Bentonite Tubes: Place bentonite tubes along the base of the first panel course on sidewall applications to provide protection at the footing-foundation joint.
- 3.1.2 Chemically Modified Bentonite Spray:
  - 3.1.2.1 Remove damaged material if damage is extensive, and completely clean area of application.
  - 3.1.2.2 If small spot repair is all that is required, cover damaged area with bentonite panel or pour loose dry granular bentonite adjacent to the damage.
  - 3.1.2.3 For large scale repair work, apply a spray coating of minimum 3/8-inch bentonite to the damaged surface.
  - 3.1.2.4 At foundation-footing joint spray, application shall be two inches thick in a cove or cant configuration.
  - 3.1.2.5 Spray joints with a double thickness, resulting in a membrane 3/4 inch to one inch thick. For small areas, joint seal may be trowel- applied.
- 3.1.3 Miscellaneous Joint Seals:
  - 3.1.3.1 Bentonite Gel shall be trowel-applied to concrete for sealing construction joints, form tie voids, and wall penetrations.
  - 3.1.3.2 Bulk granular bentonite may be poured at the base joints of walls and foundations.
  - 3.1.3.3 Press Joint-Pak Containers filled with dry granular bentonite into preformed joint cavities next to PVC waterstop in joints between two concrete pours.

END OF SECTION 07130



## 07000 - Thermal & Moisture Protection

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### SECTION 07140

#### METAL OXIDE WATERPROOFING

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of metal oxide waterproofing. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation and surface preparation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
- 2.1 Metallic Aggregate shall be clean, finely ground iron of carefully graduated sizes that will meet the following standard screen analysis. All of it shall pass a No. 35 sieve. At least 90 percent shall pass a No. 40 sieve, not less than 45 percent nor more than 60 percent shall pass a No. 100 sieve, and not more than 20 percent shall pass a No. 200 sieve.
- 2.2 Chemical Oxidizing Agent shall be an ammonium-free catalyzing agent and a water-reducing agent.
- 2.3 Foreign Matter shall be limited to 0.1 percent maximum.
- 2.4 Iron Oxide Particles shall be limited to 5 percent maximum.
- 2.5 Portland Cement: Do not use air-entraining cement. Portland cement shall comply with ASTM C 150, Type I or Type III when required.
- 2.6 Sand shall be clean and of the following gradation:
- | Sieve No. | Percent Passing |
|-----------|-----------------|
| 4         | 95 to 100       |
| 8         | 80 to 100       |
| 16        | 50 to 85        |
| 30        | 25 to 60        |
| 50        | 10 to 30        |
| 100       | 2 to 10         |
- 2.7 Water: Water shall be clean, fresh, and free from injurious amounts of oil, acid, salt, alkali, organic matter, or other deleterious substances.
- 3.0 Execution:
- 3.1 Preparation: Surface shall be thoroughly cleaned, to be free of oil, grease, laitance, and loose material.
- 3.2 Installation:
- 3.2.1 Coats: Apply four coats of waterproofing.
- 3.2.2 Procedure:
- 3.2.2.1 Odd Numbered Coats: Saturate surfaces to be waterproofed with water. With a stiff brush, scrub in a wet mixture of one part metallic waterproofing and three parts water by volume.



## 07000 - Thermal & Moisture Protection

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- 3.3.2.2 Even Numbered Coats: When waterproofing has oxidized to a reddish-brownish color, saturate the surface with water and brush on a mixture of one part waterproofing, three parts Portland cement, one part masonry sand, and sufficient water to make a smooth mix.

END OF SECTION 07140



## 07000 - Thermal & Moisture Protection

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### SECTION 07160

#### BITUMINOUS DAMPPROOFING

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of bituminous dampproofing. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation and surface preparation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
  - 2.1 Asphalt Dampproofing:
    - 2.1.1 Primer: ASTM D 41 - 41 or BS/A or M.E.A. approval.
    - 2.1.2 Cement, Bituminous Plastic: ASTM D 449. A heavy-bodied asphalt emulsion of brush or power spray consistency.
    - 2.1.3 Asphalt: ASTM D 449. Hot asphalt or asphalt emulsions for mop application.
  - 2.2 Tar Dampproofing:
    - 2.2.1 Primer: Creosote complying with ASTM D 43.
    - 2.2.2 Bitumen: Coal-tar pitch complying with ASTM D 450.
- 3.0 EXECUTION:
  - 3.1 Preparation: Remove all materials completely, exposing the base surfaces which the dampproofing materials are to be applied.
  - 3.2 Installation:
    - 3.2.2 Application of Creosote Primer: Apply with a brush or roller to entire surface.
    - 3.2.3 Interior and Exterior Cold Application: Brush or spray apply without thinning in a continuous unbroken film, free from pinholes or other surface breaks. Apply to entire primed area.
    - 3.2.4 Exterior Hot Application:
      - 3.2.4.1 Coal-Tar Pitch: Apply over exposed surface area with mop or roller in a continuous, unbroken film, free from pinholes.
      - 3.2.4.2 Asphalt: Mop two coats of hot asphalt over the entire primed area. Use not less than 25 pounds per 100 square feet.

END OF SECTION 07160



## SECTION 07170

### SILICONE DAMPROOFING

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of silicone dampproofing. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation and surface preparation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of material shall be as required to support the work.
- 2.0 PRODUCTS: Silicone water repellent (5 percent solution) shall be a clear, ready to use liquid consisting of polymerized silicone resins and penetrating hydrocarbon solvents specifically formulated to repel water. Silicone solution shall be submitted for review.
- 3.0 EXECUTION:
  - 3.1 Precautions: Immediately remove any solution that comes in contact with glass surfaces. Protect glass surfaces with polyethylene.
  - 3.2 Installation: Apply silicone solution by brush or a low pressure spray unit. If pumped from a barrel, use an agitator. Apply in one or two coats so that the surface is flooded to the point of maximum absorption. Start at top and work down, providing a continuous rundown of 6 to 12 inches during application. Start at top with second coat as soon as drop has been made.

END OF SECTION 07170



## 07000 - Thermal & Moisture Protection

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### SECTION 07175

#### WATER-REPELLENT COATING DAMPPROOFING

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of water-repellent coating dampproofing. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation and surface preparation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
- 2.1 General: The materials shall be impervious to the following solutions:
- Water.
  - One percent soap solution.
  - Salt solutions.
  - Most dilute acids.
  - Most alkalies.
  - Urine.
  - Color fast and non-yellowing.
- 2.2 Acrylic Sealers: Clear, water-white, non-staining sealing compound shall consist of a blend of penetrating and film-forming materials in a petroleum distillate and a methylacrylate resin and shall have a flash point (tag open cup) of 82 F minimum. The product must breathe and have the ability to be later recoated without any special treatment.
- 2.3 Polymeric Resins: Clear, colorless, inorganic polymer water repellents for impregnating and hardening the surfaces. The product must breathe and have the ability to be later recoated without any special treatment.
- 2.4 Polyester Resins: A mixture of modified polyester resins.
- 2.5 Buterate Resins: Clear liquid, one component mixture of selected buterate resins in a mineral spirit base.
- 3.0 EXECUTE:
- 3.1 Preparation: Prior to application of dampproofing fill voids, cracks, and holes with cement mortar.
- 3.2 Installation: Coating may be applied by conventional spray equipment, airless spray equipment, brush, or roll.

END OF SECTION 07175



## SECTION 07180

### CEMENTITIOUS DAMPROOFING

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of cementitious dampproofing. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation and surface preparation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Portland Cement: ASTM C 150, Type I cement shall be used when the special properties of other types are not required.
- 2.2 Sand: Washed silica sand graded within the following limits:
- | Sieve   | Percent Passing |
|---------|-----------------|
| No. 4   | 95 to 100       |
| No. 8   | 80 to 100       |
| No. 16  | 50 to 85        |
| No. 30  | 25 to 60        |
| No. 50  | 10 to 30        |
| No. 100 | 2 to 10         |
- 2.3 Water: Clean, fresh, and free from injurious amounts of oil, acid, salt, alkali, organic matter, or other deleterious substances.
- 2.4 Bonding Agent:
- 2.4.1 A re-emulsifiable one-component liquid resinous emulsion shall be used where area is not subject to constant dampness.
- 2.4.2 A two-component epoxy resin compound shall be used in areas under damp conditions.
- 2.5 Waterproofing Admixtures: A calcinated solution of colloidal resins that increases impermeability, workability, and compressive strength of mortar.
- 3.0 EXECUTION:
- 3.1 Preparation: Remove all materials completely, exposing the base surfaces to which the dampproofing materials are to be applied.
- 3.2 Installation:
- 3.2.1 Bonding Agent: Apply as required.
- 3.2.2 Bearing Surface: Parge or apply a coating of the cementitious mixture to the areas to be dampproofed, using a brush or trowel. Minimum thickness shall be 1/4 inch.

END OF SECTION 07180



## 07000 - Thermal & Moisture Protection

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### SECTION 07210

#### BATT AND BLANKET BUILDING INSULATION

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of batt and blanket building insulation. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation and surface preparations procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
  - 2.1 Mineral Fiber Insulation Type II.
  - 2.2 Reflective Insulation Type III.
  - 2.3 Membrane Covering: All vapor permeable back surface coverings, membrane coverings, or facings affixed to insulation in compliance with ASTM E 84 shall have a flame spread rating not greater than 25 and a smoke developed rating not greater than 50 when tested.
  - 2.4 Separately Applied Vapor Barriers:
    - 2.4.1 General: Separate vapor barrier material shall have a permeability of 1.0 perm or less, in compliance with procedure "A" of ASTM E 96.
    - 2.4.2 Ground Cover for Crawl Spaces: Ground cover for crawl space applications shall have a permeability of 0.5 perm or less, in compliance with ASTM E 154.
- 3.0 EXECUTION:
  - 3.1 Preparation:
    - 3.1.1 Separately Applied Vapor Barriers: All surfaces on which separately applied vapor barrier material is to be applied shall be free of any projections that might puncture the vapor barrier material.
    - 3.1.2 Masonry Wall Applications: Provide wood fastening strips for fastening rigid insulation to masonry walls.
  - 3.2 Installation. Install insulation to a thickness necessary to provide the designated or directed R-value.
    - 3.2.1 Exterior Walls:
      - 3.2.1.1 Insulate each space between framing members completely with batt or blanket type insulation sized to fit the full width of the space.
      - 3.2.1.2 Install Insulation having an affixed facing with the facing toward the interior (warm-in-winter) side of the construction.
      - 3.2.1.3 Install Reflective Insulation with an air space of not less than 3/4 inch, adjacent to the reflective facing, when insulation thickness permits.





## 07000 - Thermal & Moisture Protection

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- 3.2.1.4 Crawl Spaces (Unvented): Contractor shall cut vent openings in exterior walls of crawl spaces, frame as necessary to reinforce the openings, and install wood or aluminum louvers and screening.
- 3.2.1.5 Crawl Spaces (Vented): Insulate each space between framing members completely with batt or blanket type insulation sized to fit the full width of the space.
- 3.2.1.6 Ceiling: Insulate each space between framing members completely with batt or blanket type building insulation, sized to fit the full width of the space. Install insulation around, not over, all recessed lighting fixtures in ceiling construction. Install insulation so as to permit air passage from eave vents to air space above insulation.

END OF SECTION 07210



## 07000 - Thermal & Moisture Protection

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### SECTION 07211

#### LOOSE OR GRANULAR FILL INSULATION

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of loose or granular fill insulation. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation and surface preparation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
  - 2.1 Mineral Fiber Insulation Type I, Class A or B.
  - 2.2 Perlite Insulation silicone treated for water repellency.
  - 2.3 Vermiculite Insulation Type I, Class 2, treated for water repellency.
- 3.0 EXECUTION:
  - 3.1 Preparation:
    - 3.1.1 Cavity Applications: Close off all openings in cavities to receive loose or granular fill insulation, except at the top so as to permanently prevent insulation from escaping.
    - 3.1.2 Ceiling Applications: Wherever loose or granular fill insulation is to be applied over dropped soffit or other large cavities exposed to the attic, install fiberboard or other suitable material between framing members over soffit cavity to support insulation.
  - 3.2 Installation:
    - 3.2.1 Install insulation to a thickness necessary to provide the designated R-value.
    - 3.2.2 Install insulation to completely fill all required ceiling and horizontal areas.

END OF SECTION 07211



## SECTION 07212

### RIGID INSULATION

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of rigid insulation. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation and surface preparation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
- 2.1 Mineral Fiberboard Insulation Form A, class as specified.
- 2.2 Polystyrene Plastic Board Insulation Type II, class B.
- 2.3 Urethane Plastic Board Insulation Type I, class 2.
- 2.4 Cellular Glass Block Insulation Type I.
- 2.5 Organic Fiberboard Insulation Organic Fiberboard Insulation shall be chemically treated to resist decay, fungus growth, and insect attack.
- 2.6 Corkboard Insulation
- 2.7 Glass Fiberboard Insulation
- 3.0 EXECUTION:
- 3.1 Preparation: All surfaces to which rigid insulation will be mastic-mounted shall be free from all materials that will prevent proper adhesion.
- 3.2 Installation: Install insulation to a thickness necessary to provide the designated R-value.
- END OF SECTION 07212



## 07000 - Thermal & Moisture Protection

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### SECTION 07213

#### PERIMETER INSULATION

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of perimeter insulation. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation and surface preparation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Polystyrene Insulation Board Type I, Class A.
- 2.2 Urethane Insulation Board Type I, Grade 2, Class 1. Urethane insulation board shall have a minimum density of 1.7 pounds per cubic foot.
- 2.3 Insulation Thickness shall be 1 inch, except where otherwise specified or directed.
- 2.4 Surface Burning Characteristics: Insulation shall have a maximum flame spread index of 25, in compliance with ASTM E 84.
- 2.5 Plastic Cement
- 2.6 Asphalt-Saturated Felts shall comply with ASTM D 226, Type I.
- 2.7 Adhesive or Mastic for bonding insulation shall comply with applicable fire-resistance requirements for the insulation being installed.
- 3.0 EXECUTION:
- 3.1 Preparation: The Contractor shall remove all materials and construction necessary to gain access to the work.
- 3.2 Installation: Apply insulation to the full thickness required over the entire area to be insulated.
- 3.3 Reconstruction: Restore existing slabs, construction, and finishes that have been removed for the installation of insulation or damaged to their original condition.
- 3.4 Restoration of Landscaping: Restore landscaping that is disturbed to its original condition.
- 3.3 Reconstruction: Restore existing slabs, construction, and finishes that have been removed for the installation of insulation or damaged to their original condition.
- 3.4 Restoration of Landscaping: Restore landscaping that is disturbed to its original condition.

END OF SECTION 07213



## SECTION 07215

### SPRAYED-ON INSULATION

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of sprayed-on insulation. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation and surface preparation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
  - 2.1 Urethane Foamed-in-Place Insulation shall be a spray-applied two-component materials that when mixed together in proper proportions produces a rigid closed cell foam material.
    - 2.1.1 Physical Properties of cured foam shall be as follows:
      - 2.1.1.1 Nominal Density shall be 1.5 to 2.5 lbs/cu ft (ASTM D 1622).
      - 2.1.1.2 Closed Cell Content shall be 90 percent minimum.
      - 2.1.1.3 Compressive Strength, parallel to rise, shall be 40 psi.
      - 2.1.1.4 Thermal Conductivity (k factor) Btuh/psf/F/in. shall be 0.17 when aged 90 days at 14 F dry heat (ASTM C 518).
      - 2.1.1.5 Vapor Transmission shall be 3.0 perm-inch.
      - 2.1.1.6 Water Absorption shall be 3.0 percent.
- 3.0 EXECUTION:
  - 3.1 Substrates shall be cleaned prior to application of sprayed-on insulation.
  - 3.2 Openings in Roofs to receive foamed-in-place insulation shall be closed sufficiently to prevent escape of insulation.
  - 3.3 Protect Installed Insulation from harmful weather exposures and possible physical abuses including fire hazards.

END OF SECTION 07215



## 07000 - Thermal & Moisture Protection

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### SECTION 07223

#### ROOF INSULATION AND UNDERLAYMENT - CELLULAR GLASS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of cellular glass. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation and surface preparation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
  - 2.1 Cellular Glass Block Insulation: ASTM C 552, Type I, rigid, closed cell, noncombustible, foamed glass blocks. Sizes shall be manufacturer's standard sizes and required thickness, edges square.
  - 2.2 Cellular Glass Board Insulation: ASTM C 552, Type IV, rigid, closed cell, noncombustible, foamed glass boards, with laminated kraft paper faces.
    - 2.2.1 Board Sizes: Manufacturer's standard sizes and required thickness with 1/4-inch bevel on long edges at bottom of board.
    - 2.2.2 Tapered Unit Sizes: Manufacturer's standard sizes and taper.
    - 2.2.3 Flame Spread Rating: Insulation shall have maximum flame spread rating of 25 when tested, in compliance with ASTM E 84.
- 3.0 EXECUTION:
  - 3.1 Installation: Place beveled edge of board units to the deck surface in same direction continuously throughout each course.
  - 3.2 Insulation shall be installed to a thickness necessary to provide the designated R-value.

END OF SECTION 07223



## SECTION 07224

### ROOF INSULATION AND UNDERLAYMENT - MINERAL FIBER

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of mineral fiber. Products shall match existing material and/or shall be as directed by the Contracting Officer. Installation and surface preparation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS: Insulation board rigid inorganic fiberboard formed with fillers and water-resistant binders.
- 2.1 Glass Fiberboard: Mineral fiber insulation boards formed of glass fibers shall be bonded together with asphalt and surfaced on top surface with glass-fiber reinforced asphalt mat.
- 2.2 Mineral Fiberboard: Mineral fiber insulation boards formed of rock or slag processed into fiber shall be bonded together with asphalt and surfaced on top surface with asphalt saturated felt.
- 2.3 Flame Spread Rating: Insulation shall have maximum flame spread rating of 25 when tested in compliance with ASTM E 84.
- 3.0 EXECUTION: Install insulation to a thickness necessary to provide the designated R-value.

END OF SECTION 07224



## 07000 - Thermal & Moisture Protection

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### SECTION 07225

#### ROOF INSULATION AND UNDERLAYMENT - COMPOSITE BOARD

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of composite board. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation and surface preparation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Composite Board Insulation shall consist of two insulation boards chemically bonded together. Top board shall be expanded rigid polyurethane foam board; top surface shall be surfaced with one layer of asphalt saturated felt or glass fiber mat. Second layer shall be one of the following materials:
- 2.1.1 Inorganic Perlite Mineral Aggregate Board:
- 2.1.2 Inorganic Glass Fiberboard:
- 2.1.3 Mineral Fiberboard:
- 2.2 Flame Spread Rating: Insulation shall have maximum flame spread rating of 25 when tested in compliance with ASTM E 84.
- 2.3 Edge Sealant: Mastic sealant of type recommended by insulation manufacturer.
- 3.0 EXECUTION:
- 3.1 Installation: Install composite insulation boards with urethane surface up.
- 3.2 Insulation shall be installed to a thickness necessary to provide the designated R-value.

END OF SECTION 07225





## SECTION 07227

### ROOF INSULATION AND UNDERLAYMENT - FIBERBOARD

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of fiberboard. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation and surface preparation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 General: ASTM C 208, Rigid, organic fiberboard derived from wood, cane, or other vegetable fibers, formed with fillers and water-resistant binders.
- 2.2 Asphalt Impregnation: Insulation board shall be impregnated with asphalt, applied at rate not to exceed 4 percent by weight.
- 2.3 Bituminous Coating: Insulation board shall be surfaced with manufacturer's standard bituminous coating.
- 2.4 Flame Spread Rating: Insulation shall have maximum flame spread rating of 25 when tested in compliance with ASTM E 84.
- 3.0 EXECUTION: Install insulation to a thickness necessary to provide the designated R-value.
- END OF SECTION 07227



## 07000 - Thermal & Moisture Protection

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### SECTION 07250

#### SPRAYED-ON AND/OR HAND APPLIED FIREPROOFING

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of sprayed-on and/or hand applied fireproofing. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation and surface preparation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS: Products shall be provided that have been tested in accordance with ASTM E 119, UL 263, ANSI A2.I, or NFPA 251 for fire-resistance and rated by UL or other industry-recognized agency for the required resistances. Products shall be provided that have been tested and listed by UL for required surface burning characteristics (flame spread, fuel contributed, smoke developed) in accordance with ASTM E 84.
  - 2.1 Sprayed-On Cementitious Aggregate Fireproofing shall be perlite or vermiculite aggregate, inorganic cement, asbestos-free fiber reinforcement, fillers, and additives for forming a rigid, porous, noncombustible (passes ASTM E 136 test) covering to provide designated fire endurance ratings.
    - 2.1.1 Dry Density: Within range of 15 to 35 lb/cu ft, ASTM E 605.
    - 2.1.2 Compressive Strength: 10 psi for 10 percent deflection, ASTM E 761.
    - 2.1.3 Corrosion Resistance: No evidence of corrosion, from Mil. Spec. test method ML E-527, for metal surfaces to be covered.
    - 2.1.4 Bond Strength: 2 psi minimum for each application substrate, ASTM E 736.
  - 2.2 Adhesive for Bonding Fireproofing shall comply with selection requirements of applicable fire endurance tests.
  - 2.3 Metal Lath: Except as otherwise indicated, provide 3.4-pound (per sq. yd) expanded galvanized diamond steel lath, with reinforcing members and clips and other anchorage devices as appropriate for substrate and complying with selection requirements of applicable fire endurance tests. Provide corner beads and other lathing accessories of standard design and weight, where required.
  - 2.4 Fabric Reinforcement: Glass fiber mesh shall comply with selection requirements for endurance tests.
  - 2.5 Hardcoat Topping shall be high-density cementitious finish coat for 1/8-inch thick minimum application, compounded to provide increased surface hardness and improved weather resistance of fireproofing.
  - 2.6 Sealer shall be spray-on type resinous sealer, designed to reduce dusting, flaking, and spalling, but without significantly increasing surface burning (fire spread ratings) of fireproofing.
  - 2.7 Top Coating shall be chlorinated rubber, acrylic, or other breathing type coating with low surface burning characteristics, designed to protect fireproofing from weather or other designated ambient conditions.



## 07000 - Thermal & Moisture Protection

### 3.0 EXECUTION:

3.1 Preparation: Clean substrates of substances that might be incompatible with or interfere with bond of fireproofing, including oil, dirt, scale, rust, and noncompatible shop primer. Prime substrates to receive direct-bonded application of fire-proofing, except where acceptable shop primer is in satisfactory condition to receive fire-proofing. Cover other work that might be damaged by fall-out or overspray of fireproofing materials during spraying operations. Provide temporary enclosure as may be required to confine operations, protect the environment, and ensure adequate ambient conditions including temperature minimum of 55 F. Maintain substrate temperatures of at least 40 F.

### 3.2 Installation:

3.2.1 Bonded Fireproofing: Coat substrate with bonding adhesive where direct bonding of fireproofing is designated and where use of adhesive is required. Install metal lath reinforcements and substrates to receive fireproofing, as required to comply with fire endurance ratings. Anchor securely to substrates in a manner that will support fireproofing through fire exposures of periods indicated. Install lath accessories including corner beads and other stripping to be used as screeds for or reinforcement of fireproofing. Anchor to substrate, or set in a strip-bed of fireproofing material, which must then set or harden before proceeding with fireproofing installation. Provide thickness' required for compliance with indicated fire endurance ratings. Install body of fireproof covering material in a single course.

3.2.2 Aggregate Type Fireproofing: Tamp or wood-float trowel freshly-placed fireproofing to level surfaces and provide a medium smooth texture.

### 4.0 SUBMITTALS

#### 4.1 Test Reports:

4.1.1 Submit copies of fire test reports of sprayed fireproofing application to substrate materials required.

4.1.2 Submit certified test reports of acceptable testing agencies which perform testing in accordance with ASTM E 119 and E 84.

4.2 Manufacturer's Instructions: Furnish manufacturer's printed material specifications and application instructions for each type of sprayed fireproofing.

#### 4.3 Certificates:

4.3.1 Furnish manufacturer's certification that materials meet or exceed specification requirements.

4.3.2 Furnish applicator's certification that material has been completed as specified to meet fire resistance ratings, thickness requirements, and application requirements.

#### 4.4 Job Mock - Up:

4.4.1 Install typical sample section of approximately 5 sq. ft. ( 4.5m<sup>2</sup> ) on representative substrate for Corpus Christi Army Depot review and to establish requirements of fire ratings and finish texture.

4.4.2 Comply with project requirements as to thickness, density of application and fire rating.

4.4.3 Examine installation within one hour of completion to inspect variance due to shrinkage, temperature, and humidity.

### 5.0 TESTING:



## 07000 - Thermal & Moisture Protection

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- 5.1 Fire Resistance rating of Assemblies: ASTM E 11971.
- 5.2 Flame spread rating for materials: ASTM E 84 - 70.
- 5.3 Bond strength of assemblies: ASTM E 72 - 68, tested to provide minimum bond strength 20 times weight of fireproofing materials.

END OF SECTION 07256



## SECTION 07310

### ASPHALT SHINGLES

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of asphalt shingles. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation and surface preparation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
  - 2.1 Nails shall be nonferrous metal or zinc-coated steel long enough to penetrate at least 3/4 inch into the deck sheathing.
  - 2.2 Roll Roofing:
    - 2.2.1 Smooth Surfaced: ASTM D 224, Type II.
    - 2.2.2 Mineral Surfaced: provided with 2-inch. Selvage.
  - 2.3 Shingles shall meet requirements of Underwriters' Laboratories, Inc. , for Class C wind-resistant shingles by equaling or exceeding the requirements of UL 55 and UL 997. Shingles shall be square-butt strips of uniform thickness or of thick-butt style, 12 by 36 inches, and either 2-tab or 3-tab design.
- 3.0 EXECUTION:
  - 3.1 Preparation: Loose, curled, broken, or lifted asphalt shingles shall be nailed down or replaced, if required, to provide a solid nailing base. Protruding or loose nails shall be removed or nailed down.
  - 3.2 Installation:
    - 3.2.1 Application of Roofing When Existing Roofing is Removed:
      - 3.2.1.1 Underlayment: Apply one layer of 15-pound asphalt-saturated felt to roof-deck sheathing.
      - 3.2.1.2 Underlayment: Apply two layers of 15-pound asphalt-saturated felt applied to roof-deck sheathing. A solid coating of bituminous cement shall be applied between the layers of underlayment.
      - 3.2.1.3 Shingles: Apply shingles over underlayment allowing 5-inch butt exposure, and in no case shall there be less than 2-inch head lap.
      - 3.2.1.4 Hips and Ridges shall be formed with 9- by 12-inch individual shingles.
      - 3.2.1.5 Valleys:
        - 3.2.1.5.1 Closed Woven-Shingle Valleys shall have a single-layer lining of smooth-surfaced or mineral-surfaced roll roofing, 36 inches wide.
        - 3.2.1.5.2 Roll Roofing Valley shall be two thickness' of mineral-surfaced roll roofing.



## 07000 - Thermal & Moisture Protection

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- 3.2.2 Application of Roofing Over Existing Asphalt Shingles: Shingles shall be applied over old shingles with butt exposure, except for starter course, equal to old shingles, and in no case shall there be less than 2-inch head lap.
- 3.2.3 Roof Patching and Replacement: Match existing shingles in design, weight, texture, pattern, and color.

END OF SECTION 07310



## SECTION 07313

### WOOD SHINGLES AND SHAKES

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of wood shingles and shakes. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
  - 2.1 Nails shall be hot-dipped zinc-coated steel or aluminum long enough to penetrate 3/4 inch into deck sheathing.
  - 2.2 Wood Shingles: Shingles shall comply with Red Cedar Shingles and Hand-Split Shake Bureau, No. 1 Grade, 100 percent heartwood, 100 percent clear, and 100 percent vertical or edge grained, 16 inches in length and a butt thickness of 0.40 inch and shall meet the requirements of UL 790 for Class B prepared roof covering.
  - 2.3 Wood Shakes: Wood shakes shall be Western Red Cedar, No. 1 Grade, 100 percent heartwood, 100 percent clear, and 100 percent vertical or edge grained. Wood shakes shall be 18 inches in length, except for starter and finish shakes, which may be 15 inches and shall have an average butt thickness of 1/2 inch. Shakes shall meet the requirements of UL 790 for Class B prepared roof covering. Hand-split and resawn shakes shall have split faces and sawn backs. Taper split shakes and straight split shakes shall be produced by hand.
  - 2.4 Asphalt Saturated Felt Underlayment shall comply with ASTM D 226, Type I and Type II.
- 3.0 EXECUTION:
  - 3.1 Application of Wood Shingles: Apply shingles in straight, single courses with matching or designated butt exposure. Shingles shall be doubled at eaves, and butts of first course shingles shall project 1-1/2 inches beyond the eave line to form a drip.
  - 3.2 Application of Wood Shakes: Apply shakes in straight, single courses with matching or designated butt exposure. Along the eave line, install a 36-inch wide strip of Type II asphalt saturated felt over sheathing boards. Install double starter course of shakes over the felt projecting 2 inches beyond the eave line to form a drip. After each course of shakes is applied, lay an 18-inch wide strip of Type II asphalt saturated felt over top portion of the shakes, extending onto sheathing. Position bottom edge of felt above the butt at a distance equal to twice the weather exposure.

END OF SECTION 07313



## 07000 - Thermal & Moisture Protection

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### SECTION 07314

#### SLATE ROOFING

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of slate roofing. Products shall be as directed by the Contracting Officer. Installation and surface preparation procedures shall be in accordance with the product manufacture's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Nailing Slate and Tile: Fasten slate and tile to wood decks with large head copper slating nails. Fasten to nailing concrete or other nailable masonry surfaces with 8 ga. large head Moinel metal nails. Drive nails straight and true. Do not drive nails so far that they produce tension in the slate or tile.
- 2.2 Shingles: Replace existing tractional units adjoining new slates with new whole units to match. Fit slate and tile neatly around pipes, ventilators and other projecting work.
- 3.0 EXECUTION:
- 3.1 Preparation: Repair, prepare and clean surfaces at b-vase of slate and tile roofing per manufacturer's recommendations.
- 3.2 Installation:
- 3.2.1 Laying Shingles: Lay shingles with 5" exposure and 1" head lap, (triple coverage). Lay shingles in straight courses parallel to eaves with cut-outs in vertical alignment and centered on the overlaying shingles. Do not lay shingles with damaged edges or other defects. Lay the down slope courses of shingles over the manufacturer's standard starting strips. Each shingle shall be laid so it barely touches the adjacent shingles in the same course. Extend shingles 1/2" over edge of eaves and 1/4" over edge of exposed gable ends. Lay shingles symmetrically about valleys and hips. Fit neatly at pipes, ventilators and other projecting surfaces. Lay shingles to form closed valleys.
- 3.2.2 Underlayment Felt: Apply number 30 wt. asphalt saturated felt in valleys and over all roof areas at base of slate as specified for Asphalt Shingle Roofing. Turn this ply up to top of nailing strips and secure at 12" intervals.

END OF SECTION 07314





## SECTION 07320

### CLAY ROOFING TILES

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of clay roofing tiles. Products shall match existing installation of clay roofing tiles. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation and surface preparation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
  - 2.1 Mortar: Mixture of Portland cement, sand, and pigment.
  - 2.2 Nails: Copper or non-corrosive metal.
    - 2.2.1 Ring Type Nails: Used on plywood sheathing.
    - 2.2.2 Slater's Nails: Minimum of 1-1/2 inches long and shall be used on board sheathing.
  - 2.3 Asphalt-Saturated Organic Felt shall comply with ASTM D 226.
  - 2.4 Roofing Tiles shall be clay or shale product that is burned to a hard dense structure, glazed or nonglazed on exposed surfaces.
- 3.0 EXECUTION:
  - 3.1 Underlayment: Apply one layer of 30-pound asphalt-saturated felt to roof-deck sheathing.
  - 3.2 Application of Slab Shingle Tiles: Install a 3/4-inch by 1-inch cant strip along eave. On top of cant install under-eave tiles, projecting 1 inch over the rear edge of gutter and flush with the gable edge. Install first course of roofing tiles flush with butt edge of under-eave tile and extend 2 inches over the gable ends. Lay field tiles in straight courses with 2-inch head lap and secure with roofing nails in all holes provided in tiles. Lay all tiles within one foot of hips, ridges, and abutting vertical surfaces in bituminous cement.
  - 3.3 Application of Interlocking Tiles: Install cant strip or under-eave fittings as required by tile configuration. On top of cant or under-eave fitting, install first course of roofing tiles projecting 1 inch over rear edge of gutter. Lay roof tiles with straight butt lines, interlocked into adjoining tiles with a 3-inch headlap and secure with nails in all holes provided in tiles. Provide gable rake fittings at all gables.
  - 3.4 Application of Spanish and Mission Tiles: Install cant strip over eave closure fittings and nailing strips as required by configuration of tiles. Set eave closures back 2 inches from lower edge of eave. Lay tiles in straight vertical lines up roof and with uniform exposure to weather. Give all tiles minimum lap of 3 inches, and extend eave tiles 1 inch over edge of gutters. Fit all tiles properly and secure with nails in all holes provided. Nails shall be long enough to penetrate at least 1 inch into wood base. Complete and nail cover tiles to gable rakes with bituminous cement, all the way up the gables. When eave closures and top fixtures are not required, cement eaves and joint at ridge with mortar.



## 07000 - Thermal & Moisture Protection

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- 3.5 Replacing Individual Spanish or Mission Roofing Tiles: Remove broken tiles by cutting nails with a ripper. Insert new tile of the same color and size as broken one by troweling Portland cement mortar on new tile surface that will be lapped by tile in course above and on surface that will lap tile in course below. Fasten new tile in place with metal strap or wire.

END OF SECTION 07320



## SECTION 07322a

### CONCRETE ROOFING TILES

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of concrete roofing tiles. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
  - 2.1 Mortar: Mixture of Portland cement, sand, and pigment.
  - 2.2 Nails: Copper or noncorrosive metal.
    - 2.2.1 Ring Type Nails: Used on plywood sheathing.
    - 2.2.2 Slater's Nails: Used on board sheathing,
  - 2.3 Roofing Tiles: Waterproof concrete product reinforced with steel wire. Each tile shall be manufactured with nail holes. Standard rake, closures, hip, and ridge fittings same color as tile, shall be provided.
  - 2.4 Asphalt-Saturated Organic Felt shall comply with ASTM D 226.
- 3.0 EXECUTION:
  - 3.1 Underlayment: Apply one layer of 30-pound asphalt-saturated felt to roof-deck sheathing.
  - 3.2 Application of Slab Shingle Tiles: Apply 1-inch by 1/2-inch cant strip 1/2 inch from edge of eave. On top of cant, install a starter strip of tiles projecting 1 inch over rear edge of gutters and 1 inch beyond gable ends. Install the first course of tiles flush with edges of starter strip. Lay field tiles in straight courses with a 2-inch head lap and secure with two large-head roofing nails. Lay all tiles within 1 foot of hips, ridges, and abutting vertical surfaces in bituminous cement.
  - 3.3 Application of Interlocking Tiles: Install cant strip or under-eave fittings as required by tile configuration. On top of cant, or under-eave fitting, install first course of roof tile projecting 1 inch over the rear edge of gutter. Lay roof tiles with straight butt lines interlocked into adjoining tiles with a 3-inch headlap and secure with nails in all holes provided in the tiles. Provide gable rake fittings at all gables.

END OF SECTION 07322a



## 07000 - Thermal & Moisture Protection

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### SECTION 07322b

#### PRECAST CONCRETE OR TILE TRAFFIC TOPPING

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of precast concrete or tile traffic topping. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation and surface preparation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
- 2.1 Precast Concrete Tiles:
- 2.1.1 Compressive Strength: Precast concrete tiles shall have a strength of 3,000 pounds per square inch at 28 days.
- 2.1.2 Quality Assurance: Absorption shall not exceed 8 percent by weight.
- 2.2 Quarry Tile: ANSI A 137.1.
- 2.3 Drainage Bed: ASTM D 1863, crushed stone, maximum size 1/2 inch.
- 2.4 Mortar Materials:
- 2.4.1 Portland Cement: ASTM C 150, Type I, low alkali content.
- 2.4.2 Sand: ASTM C 144.
- 2.4.3 Hydrated Lime: ASTM C 207, Type S.
- 2.4.4 Setting Bed Mortar Mix: One part Portland cement, three parts dame sand.
- 2.4.5 Pointing Mortar: One part Portland cement, two parts fine graded sand, 1/5 part lime.
- 2.5 Sealant: Sumit Manufacturer Data for review, two-component elastomeric type compound.
- 3.0 EXECUTION:
- 3.1 Preparation: Prior to installing any roof traffic tiles, coat areas to receive tiles with a solid application of bitumen used in roofing system,
- 3.2 Installation:
- 3.2.1 Drainage Bed: In areas to receive traffic roof tiles, install. 1-1/2 inch thick drainage bed.
- 3.2.2 Tiles: Lay tiles in l-inch thick mortar bed. Provide 3/16-inch to 1/4-inch wide joints between tiles.
- END OF SECTION 07322b



## SECTION 07400

### PREFORMED ROOFING AND SIDING

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of preformed roofing and siding panels. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation and surface preparation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
  - 2.1 Aluminum Roof Panels: Fabricated from roll-formed panels of aluminum alloy in accordance with ASTM B 209, tempered as required for forming operation, with a minimum thickness of 0.032 inch. Thickness of panels shall be the standard thickness as required for roofing span and design loading.
    - 2.1.1 Color-Coated Finish. One of the following standard factory-applied, baked-on coatings:
      - 2.1.1.1 Acrylic Enamel Coating: Epoxy primer and acrylic enamel top coat, dry film thickness not less than 0.2 mil for primer and 0.8 mil for topcoat,
      - 2.1.1.2 Fluoropolymer Coating: Full strength 70 percent polyvinylidene fluoride finish, dry film thickness not less than 1.0 mil over a minimum 0.2 mil baked-on modified epoxy primer.
      - 2.1.1.3 Siliconized Polyester Coating: Epoxy primer and silicone-modified polyester enamel topcoat, dry film thickness not less than 0.2 mil for primer and 0.8 mil for topcoat.
    - 2.1.2 Factory Prime Coating: Factory-applied baked-on epoxy primer coat, not less than 0.2 mil dry film thickness applied after pretreatment.
    - 2.1.3 Natural Finish: Stucco embossed finish, plain mill-finished or special alloy-clad sheet (Alclad), as required.
    - 2.1.4 Corrugated Panels shall be standard 7/8 inch deep with corrugation crests at 2.67 inches on centers with either interlocking ribs or overlapping side laps at side joints, as required.
    - 2.1.5 V-Beam Panels shall be standard V-shaped ribbed panels, nominally 4-7/8 inches on centers and 1-3/4 inches deep with either interlocking ribs or overlapping side laps at side joints, as required.
  - 2.2 Steel Roof Panels shall be factory-painted steel metal panels which shall be zinc-coated steel conforming to ASTM A 446, Grade A, G90 zinc coating designation. Roof covering shall be 22 galvanized sheet gauge or thicker. Steel roof panels shall be factory prime-coated and color-coated with one of the color coatings specified for aluminum roof panels.
    - 2.2.1 Corrugated Panels shall have similar dimensional and side joint characteristics as specified for aluminum roof panels.
    - 2.2.2 Box Rib Panels shall be standard units, approximately 1-1/2 inches deep with 1-3/8 inch wide flutes and 5 box ribs at 7-13/64 inches on centers for a 36-inch wide coverage.



## 07000 - Thermal & Moisture Protection

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- 2.2.3 Four-Inch Ribbed Panels shall be standard units approximately 1 inch deep with 9 box ribs at 4 inches on centers for a panel width of 37-1/2 inches.
- 2.3 Standing Seam Roofing:
  - 2.3.1 General: Roof-covering panels shall be fabricated of zinc-coated steel conforming to ASTM A 446, G90 coating designation or aluminum-coated steel conforming to Mil. Spec. MIL-S-4174, Type II. Roof covering shall be 24 galvanized sheet. gauge or thicker. Panels shall have configurations designed for mechanically formed lock seams for securing adjacent sheets. Sealant for standing seams shall be factory-applied. Width of sheets shall provide not less than 12 inches of coverage in place. Height of standing seam shall be not less than 2-1/2 inches for slopes less than 3 inches in 12 inches, and not less than 1-3/4 inches for slopes 3 inches in 12 inches or greater.
  - 2.3.2 Color Coating: Color finish shall consist of either a synthetic resin base coating applied to a pretreated and primed surface or a dry film coating material bonded to the metal substrate with adhesive. Dry film thickness of color coat shall be not less than 0.8 mil for exterior surface finish.
  - 2.3.3 Accessories shall include flashing, trim, caps, and similar accessories of not less than the minimum thickness' specified for roofing. Accessories of zinc-coated steel used with aluminum-coated steel shall be painted. Molded closure strips shall be closed-cell or solid-cell synthetic rubber, neoprene, or polyvinyl chloride premolded to match configuration of the covering.
  - 2.3.4 Panel Clips shall be of two-piece construction with movable tabs. Clips shall provide for at least 2 inches of panel movement. Tabs shall be designed to be folded into the lock seam.
  - 2.3.5 Fasteners shall be zinc-coated steel or corrosion-resisting steel.
    - 2.3.5.1 Screws shall be not less than No. 14 diameter if self-tapping type and not less than No. 12 diameter if self-drilling and self-tapping type.
    - 2.3.5.2 Blind Rivets shall be stainless steel.
    - 2.3.5.3 Bolts shall be not less than 1/4-inch diameter, shouldered or plain shank, as required, with proper nuts.
- 2.4 Aluminized Steel Roof Panels
  - 2.4.1 General: Roof panels shall be formed of Type II aluminized sheet in accordance with ASTM A 463 and Mil. Spec. MIL-S-4174. Thickness shall be not less than 22-gauge material.
  - 2.4.2 Aluminized steel corrugated panels shall be similar to standard profiles and dimensional and side joint characteristics as specified for aluminum roof panels and steel roof panels.
- 2.5 Plastic Roof Panels:
  - 2.5.1 General: Preformed translucent plastic roof panels shall be glass fiber-reinforced polyester plastic panels conforming to ASTM D 3841.
  - 2.5.2 Non-Fire Rated Translucent Plastic Roof Panels shall be manufactured of acrylic modified resins with either a smooth or embossed finish. Glass reinforcement shall be not less than 27 percent by weight and resins approximately 73 percent by weight and shall be of high quality light-stabilized polyester, modified with acrylic monomer.
  - 2.5.3 Low Flame Spread Translucent Plastic Roof Panels shall be manufactured of light-stabilized, fire-retardant polyester approximately 75 percent by weight and modified with acrylic monomer. Glass



## 07000 - Thermal & Moisture Protection

reinforcement shall be not less than 25 percent by weight. Panels shall be classified by Underwriters' Laboratory with a flame spread of not greater than 25 when tested in accordance with ASTM E 84. Finish shall be smooth or embossed as required.

- 2.5.4 Corrosion-Resistant Opaque Panels shall be manufactured of resins composed of high quality light-stabilized polyester, modified with acrylic monomer. Where required, panels shall be the fire-retardant type classified by Underwriters' Laboratories, with a flame spread not greater than 25 when tested in accordance with ASTM E 84.
- 2.5.5 High Strength Opaque Fire-Retardant Panels suitable for walkable roof service shall be composed of high quality light-stabilized, fire-retardant polyester, modified with acrylic monomer. Glass reinforcement shall be a minimum of 38 percent, composed of woven continuous strand and chopped strand glass. Interior and exterior Surfaces shall have a surface veil. Finish shall be embossed. All panels shall be classified by Underwriters' Laboratories, with a flame spread not greater than 25 when tested in accordance with ASTM E 87.
- 2.6 Aluminum Siding Panels: Aluminum siding panels shall be similar to aluminum roofing panels. Four-inch ribbed panels shall be approximately 1 inch deep with 9 box ribs at 4 inches on centers for a panel width of 37-1/2 inches.
- 2.7 Steel Siding Panels shall be similar to steel roofing panels, including finish and profiles (except box rib profile). Thickness shall be 24 galvanized sheet gauge or thicker.
- 2.8 Insulated Siding Panels:
  - 2.8.1 Factory-assembled Sandwich Panels:
    - 2.8.1.1 General: Interior and exterior panels shall be shop- assembled, fabricated of hot-dipped, zinc-coated, roll-formed steel sheet, ASTM A 446, Grade A, except where higher strength is required for performance, and G90 zinc coating. Thickness of interior and exterior panels shall be determined for wall spans and design loading as required.
    - 2.8.1.2 Insulation shall be standard glass fiber blanket insulation, Type I, with a k-value of 0.27 at 75 F and a density of not less than 1.5 lbs/cu ft.
    - 2.8.1.3 Assembled Panel System shall have standard continuous gasket at male legs isolating metal-to-metal contact. Panels shall be factory-caulked.
    - 2.8.1.4 All Related Closures, Flashings, and Copings shall be manufactured from same gauge material as exterior face metal panel and shall be properly engineered to job conditions.
    - 2.8.1.5 Finish of Exterior Panels shall be factory prime-coated and color-coated with one of the color coatings specified for aluminum panels. Finish of interior panels shall be prime coat with a color coat as required.
  - 2.8.2 Field-Assembled Sandwich Panels:
    - 2.8.2.1 Interior Wall Facing Units shall be hot-dipped, zinc-coated, single rib design steel sheet, ASTM A 446, Grade A, G90 zinc coating. Interior wall facing units may be of 0.024 inch or thicker aluminum. Interior units shall be roll-formed in unit widths of 12 inches with 1-1/2 inch ribs or 24 inches with 2-inch ribs. Interlocking joints shall be provided between units Interior wall units shall present a flush inside wall surface.



## 07000 - Thermal & Moisture Protection

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- 2.8.2.2 Insulation: Rigid or semi-rigid board insulation Form A, Class 1 or 2. Blanket insulation shall be Form B, Type I, Class 6. Insulation shall have a flame spread not in excess of 25 and a smoke developed rating not in excess of 50 when tested in accordance with ASTM E 84. Insulation shall be of sufficient thickness to provide the designated U-value.
- 2.8.2.3 Exterior Panel Materials shall be mill-embossed finished aluminum, galvanized steel, galvanized and painted steel, or stainless steel.
  - 2.8.2.3.1 Aluminum Sheets shall be ASTM B 209. Where required, stucco embossed finish shall be provided. Where required, provide Alclad aluminum alloy-clad sheets where exposed without applied coatings.
  - 2.8.2.3.2 Steel Panels shall be metal panels of zinc-coated steel conforming to ASTM A 446, Grade A, G90 zinc coating. Where color coating is required, finish shall be factory prime-coated and color-coated with one of the color coatings specified for aluminum roof panels.
  - 2.8.2.3.3 Stainless Steel Panels shall be fabricated from ASTM A 167, sheet stock types 302 or 304 stainless steel with No. 2B surface finish. Where exposure to corrosive atmospheres or coastal areas is required, stainless steel panels shall be fabricated from ASTM 167, sheet stock type 316, with No. 2B surface finish.
- 2.9 Rigid Vinyl Siding: Shall be ASTM D4756 in accordance to Vinyl Siding Institute.
- 3.0 EXECUTION
- 3.1 General: Installation shall include all standard fasteners, flashings, sealants, gaskets, closure strips, trim, and insulation associated with roofing and siding. Provide expansion joints where required.
- 3.2 Field-Assembled Sandwich Panel Siding shall include installation of subgirts. All panels shall be erected with flutes and ribs running vertically.
- 3.3 Factory-Assembled Sandwich Panels shall be erected by means of standard concealed clip attachments.
- 3.4 Rigid Vinyl Siding: Shall be installed in accordance to Vinyl Siding Institute methods.

END OF SECTION 07410





## SECTION 07510a

### BUILT-UP ROOFING

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of built-up roofing. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation and surface preparation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
  - 2.1 Primer: Asphalt, ASTM D 41; coal-tar, ASTM D 43.
  - 2.2 Bitumen:
    - 2.2.1 Asphalt: ASTM D 312, Type I on slopes from 1/4 inch per foot up to and including 1/2 inch per foot, Type II or Type III on slopes above 1/2 inch per foot up to and including 1 inch per foot, Type III on slopes above 1 inch per foot and including 3 inches per foot.
    - 2.2.2 Coal-Tar Bitumen for slopes from 1/4 inch per foot up to and including 1/2 inch per foot: ASTM D 450, Type III, unless Type I is approved by the Contracting Officer.
    - 2.2.3 Cold-Process Asphalt Emulsion: A mechanical mixture of minute particles of asphalt and special clays suspended in water.
  - 2.3 Cants: Treated fiberboard, ASTM C 208; wood blocking treated with waterborne preservative, AWPB LP-2; or foamglass. Cants shall have maximum 5-1/2 inch face dimensions at a 45 degree incline to roof plane and lengths as long as practical.
  - 2.4 Felt:
    - 2.4.1 Organic-Fiber Felt:
      - 2.4.1.1 Plies: ASTM D 226, Type I, asphalt-saturated; or ASTM D 227, Type I, coal-tar saturated.
      - 2.4.1.2 Asphalt-Saturated Base Sheet: No. 40 felt, ASTM D 2626, Type I or II.
    - 2.4.2 Glass-Fiber Felt:
      - 2.4.2.1 Plies: ASTM D 2178, Type III or IV where average January temperature is above 40 F and Type IV where average January temperature is below 45 F.
      - 2.4.2.2 Asphalt-Impregnated Combination Base Sheet: ASTM D 2178, Type V.
    - 2.4.3 Venting Base Sheet: Asphalt-saturated and coated base sheet with granular surfacing and embossed channels (or grooves) on bottom surface.
    - 2.4.4 Cold-Process System Felts: Coated organic, glass-fiber, or a combination of both.
  - 2.5 Flashings: Bituminous and sheet metal as required.



## 07000 - Thermal & Moisture Protection

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- 2.6 Flashing Cement: Bituminous plastic cement, Type I for use with asphalt-saturated felts and Type II for use with coal-tar saturated felts.
- 2.7 Cold-Process Cement: Solvent-based cement that evaporates slowly in cool damp weather, more rapidly in hot dry weather, and is standard with the cold-process glass-fiber reinforced asphalt emulsion roofing system manufacturer.
- 2.8 Mastic: Solvent-based mastic that evaporates slowly in cool damp-weather, more rapidly in hot dry weather, and is standard with the cold-process mastic roofing system manufacturer.
- 2.9 Nails and Mechanical Fasteners: Industry standard, noncorrosive material, shape and size required for substrate.
- 2.10 Surfacing Materials:
  - 2.10.1 Aggregate: Crushed stone, gravel, or crushed slag conforming to ASTM D 1863. Subject to approval, other materials may be used when blended to the grading requirements of ASTM D 1863.
  - 2.10.2 Smooth Surfacing:
    - 2.10.2.1 Emulsion Coating: Fibrated asphalt/clay emulsion, ASTM D 1227, Type I.
    - 2.10.2.2 Reflective Coating: ASTM D 2824, Type I if non-fibrated, Type II if fibrated.
  - 2.10.3 Mineral Surfacing: Mineral surface cap sheet complying with ASTM D 3909.
- 2.11 Sheathing Paper: ASTM D 549, 5-pound resin-sized paper.
- 2.12 Wood Nailers and Edge Blocking: Non-stress graded wood members, treated with waterborne preservative in compliance with AWFB LP-2.
- 2.13 Walkway Protection Boards: Mineral surfaced bituminous composition boards, approximately 1/2 inch thick, manufactured specifically for hot bituminous application on built-up roofing as a protection course for foot traffic.
- 2.14 Roofing Systems:
  - 2.14.1 Nailable Deck, Asphalt/Organic Felt Membrane With Aggregate Surfacing: National Roofing Contractor's Association (NRCA) Specification Plate No. 31-NAOA, Diagram B for light- weight insulating concrete decks and Diagram A for other nailable decks.
  - 2.14.2 Nailable Deck, Asphalt/Glass-Fiber Felt Membrane:
    - 2.14.2.1 With Aggregate Surfacing: NRCA Specification Plate No. 32-NAGA, Diagram B for lightweight insulating concrete decks and Diagram A for other nailable decks.
    - 2.14.2.2 With Smooth Surfacing: NRCA Specification Plate No. 32-NAGA except for substitution of smooth surfacing for aggregate surfacing.
    - 2.14.2.3 With Mineral Surfacing: NRCA Specification Plate No. 32-NAGA except for deletion of one ply of felt and substitution of mineral surfacing for aggregate surfacing.
  - 2.14.3 Nailable Deck, Coal-Tar/Organic Felt Membrane with Aggregate Surfacing: NRCA Specification Plate No. 33-NCOA, Diagram B for lightweight insulating concrete decks and Diagram A for other nailable decks.



## 07000 - Thermal & Moisture Protection

- 2.14.4 Insulated Deck, Asphalt/Organic Felt Membrane with Aggregate Surfacing: NRCA Specification Plate No. 4I-IAOA; Diagram B for insulation substrate of composite board, polyisocyanurate foam board, or polyurethane foam board; Diagram A for other insulation substrates.
- 2.14.5 Insulated Deck, Asphalt/Glass-Fiber Felt Membrane:
  - 2.14.5.1 With Aggregate Surfacing: NRCA Specification Plate No. 42-IAGA; Diagram B for insulation substrate of composite board, polyisocyanurate foam board, or polyurethane foam board; Diagram A for other insulation substrates.
  - 2.14.5.2 With Smooth Surfacing: NRCA Specification Plate No. 42-IAGA except for addition of one ply of felt and substitution of smooth surfacing for aggregate surfacing.
  - 2.14.5.3 With Mineral Surfacing: NRCA Specification Plate No. 42-IAGA except for substitution of mineral surfacing for aggregate surfacing.
- 2.14.6 Insulated Deck, Coal-Tar/Organic Felt Membrane with Aggregate Surfacing: NRCA Specification Plate No. 43-ICOA; Diagram B for insulation substrate of composite board, polyisocyanurate foam board, or polyurethane foam board; Diagram A for other insulation substrates.
- 2.14.7 Concrete Deck, Asphalt/Organic Felt Membrane with Aggregate Surfacing: NRCA Specification Plate No. 5I-CAOA, Diagram A or B as directed.
- 2.14.8 Concrete Deck, Asphalt/Glass-Fiber Felt Membrane:
  - 2.14.8.1 With Aggregate Surfacing: NRCA Specification Plate No. 52-CAGA, Diagram A or B as directed.
  - 2.14.8.2 With Smooth Surfacing: NRCA Specification Plate No. 52-CAGA except for addition of one ply of felt and substitution of smooth surfacing for aggregate surfacing.
  - 2.14.8.3 With Mineral Surfacing: NRCA Specification Plate No. 52-CAGA except for substitution of mineral surfacing for aggregate surfacing.
- 2.14.9 Concrete Deck, Coal-Tar/Organic Felt Membrane with Aggregate Surfacing: NRCA Specification Plate No. 53-CCOA; Diagram A or B as directed.
- 2.14.10 Temporary Roofing: NRCA Specification IO-TR; Diagram TR-N for nailable decks, Diagram TR-C for non-nailable decks (except steel) and Diagram TR-SI for steel decks.
- 2.14.11 Cold-Process Built-Up Membrane Roofing:
  - 2.14.11.1 Glass-Fiber Reinforced Asphalt Emulsion System: Minimum two layers of coated ply felts with smooth surfacing (asphalt emulsion). less than 1 inch per foot and two plies on slopes greater than 1 inch per foot) embedded into a spray application of mastic with embedded mineral granule surfacing.
- 3.0 EXECUTION:
  - 3.1 Preparation:
    - 3.1.1 Mineral Surfaced Cap Sheet: Cut sheet in 12- to 18-foot lengths and leave to flatten prior to application.
    - 3.1.2 Temporary Roofing: Remove temporary roofing completely prior to installation of permanent roofing.
    - 3.1.3 Weather Limitations: Do not apply roofing when it is excessively windy, wet, or when the ambient temperature is less than 40 F.



## 07000 - Thermal & Moisture Protection

- 3.1.4 Heating Bitumen: Asphalt shall not be heated above 475 F, Coal tar shall not be heated above 400 F. Application temperatures shall be measured at the mop bucket and/or mechanical applicator.
- 3.2 Application:
  - 3.2.1 NRCA-Specified Roofing Systems shall be applied in accordance with the NRCA specifications.
  - 3.2.2 Smooth Surfacing: Glaze-coat entire surface of completed built-up roof membrane with hot mopping of Type III asphalt, applied at same rate and concurrent with interply moppings. Allow asphalt coating to age a minimum of 7 days, then apply top coating of asphalt emulsion at an average rate of 2.5 gallons per square. If roof is to receive reflective coating, it shall be applied promptly after application and initial cure (next day) of emulsion coating at an average rate of 1.25 gallons per square.
  - 3.2.3 Mineral Surfacing: Promptly after completion of ply-sheet membrane (same day where possible), apply one lapped course of cap sheet. Set cap sheet in uniform mopping of same hot bitumen used in ply-sheet courses, at an average rate of 15 lbs per square. Lap ends a minimum of 6 inches.
  - 3.2.4 Cold-Process Roofing Systems:
    - 3.2.4.1 Glass-Fiber Reinforced Asphalt Emulsion: Nail or spot-mop the first ply felt. Apply additional plies with cold-process cement brushed, sprayed, or rolled on at the rate of approximately 1-1/2 gallons per square. If precipitation is expected within 48 hours, a solid mopping of hot asphalt shall be used instead of cold-process cement. Over the base sheet assembly, the asphalt emulsion shall be spray applied with a three-nozzle gun that has a glass fiber cutter that disperses glass fibers 3/4 inches long into the emulsion as it is spray-applied. Reinforced asphalt emulsion shall be sprayed at the rate of approximately 9 gallons of emulsion and 3 pounds of glass-fiber reinforcement per square. If the roof is designated to receive a reflective coating, it shall be applied as soon as the asphalt emulsion membrane is firm enough to support roof traffic without indentations forming in the film.
    - 3.2.4.2 Mastic System: Embed ply felts in mastic sprayed at a rate of approximately 2-1/2 gallons per square per coat. Embed mineral surfacing in top coat of mastic.
- 3.3 Accessories and Flashings: Install flashings as recommended by the NRCA Roofing and Waterproofing Manual and the SMACNA Architectural Sheet Metal Manual. Set walkways in additional pour-coat of hot bitumen after aggregate surfacing of built-up roofing membrane.
- 3.4 Surface Maintenance of Existing Aggregate Surfaced Roofs:
  - 3.4.1 Preparation: Sweep surface and remove all loose and poorly embedded existing aggregate before applying new surface materials.
  - 3.4.2 Primer: Apply thin coat of asphalt primer over affected areas. Allow to dry thoroughly before applying flood coat.
  - 3.4.3 Flood Coat: Apply hot bitumen of type compatible with existing roofing materials, at a rate of 60 pounds per square for Type III asphalt and 75 pounds per square for coal tar.
  - 3.4.4 Aggregate Surfacing: While bitumen is hot, embed clean surfacing aggregate of type to match existing, applied at a rate of 400 pounds per square for gravel, 300 pounds per square for slag, and 400 pounds per square for crushed stone.
- 3.5 Maintenance and Repair Patching (Hot-Applied Roofing):



## 07000 - Thermal & Moisture Protection

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- 3.5.1 Blisters: Make two cuts at right angles to each other, extending cuts 12 inches beyond edge of defective areas and to substrate surface. Fold back cut areas and allow substrate and membrane to dry. Wet insulation shall be removed and replaced with dry insulation matching the original. When dry, apply solid bitumen mopping over opened area and fold cut sections of membrane into bitumen. Totally embed membrane in bitumen.
- 3.5.2 Splits: Cut out membrane at least 12 inches on each side and extending 18 to 24 inches on each side and extending 18 to 24 inches beyond each end of split area. Dry lay a 6-inch wide strip of roofing felt, cemented over split area. Apply uniform coat of bitumen over dry felt, extending to embedded aggregate in all directions.
- 3.5.3 Disintegrated and Damaged Felts: Cut and remove disintegrated, damaged, and loose felts to extent necessary to provide sound materials. Cut out wet felts and allow wet surfaces to completely dry before in-stalling patch materials. Replace removed felts with equal plies of felt. Felts shall be solidly mopped into place in hot bitumen and shingled into existing plies to extent possible.
- 3.5.4 Additional Plies: Finish defective areas by applying at least two additional plies of roofing felt, embedded in hot bitumen. Extend edges of first ply a minimum of 9 inches beyond affected area on all sides and second ply 18 inches beyond affected area on all sides.

END OF SECTION 07510a



## 07000 - Thermal & Moisture Protection

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### SECTION 07510b

#### WOOD TRAFFIC TOPPING

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of wood traffic topping. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation and surface preparation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
  - 2.1 Lumber: Standard grade or No. 2 grade, nonstress grade lumber complying with the National Grading Rule for Dimension Lumber established in compliance with Section 10 of Prod. Std. PS 20 and as applied in individual grading rules of applicable grading agencies.
    - 2.1.1 Species of Nontreated Wood: Walkway members shall be fabricated of cypress or redwood.
    - 2.1.2 Preservative Treated Wood: Walkway members shall be fabricated of preservative treated lumber, treated by pressure method in compliance with AWPB LP-2 and so marked in compliance with AWPB standard. Preservative treated members shall be air-dried or kiln-dried and marked "DRY." Treated wood that is cut after treatment shall be brush-coated with preservative used in original treatment.
    - 2.1.3 Bitumen: Type used in roofing system.
    - 2.1.4 Bituminous Cement: Bituminous plastic cement.
    - 2.1.5 Type I: For use with asphalt roofing system.
    - 2.1.6 Type II: For use with coal-tar roofing system.
    - 2.1.7 Premolded Filler Strip: ASTM D 1751, minimum 3/8 inch thick.
    - 2.1.8 Cap Sheet: asphalt saturated roofing felt, coated with strip asphalt both sides and surfaced on weathering side with mineral granules. Cap sheet shall weigh not less than 70 pounds per square.
    - 2.1.9 Prepared Roll Roofing: ASTM D 249, No. 90 asphalt saturated organic fiber felt, coated on both sides with asphalt and surfaced on weathering side with mineral granules.
- 3.0 EXECUTION:
  - 3.1 Preparation:
    - 3.1.1 Membrane Roofing:
      - 3.1.1.1 Bitumen Coating: Before installing walkways, areas to be covered shall be coated with 40-inch wide continuous path of bitumen used for roofing system.
      - 3.1.1.2 Cap Sheet Protection Course: Embed cap sheet strips in solid coat of roofing cement. Set strips at right angles to direction of walkway and 48 inches apart.



## 07000 - Thermal & Moisture Protection

- 3.1.1.3 Premolded Filler Strip: Embed premolded filler strip in solid coat of roofing cement. Set filler at right angles and direction of walkway and 48 inches on center.
- 3.1.1.4 Sloping Roofs: Cover areas to be covered with wood walkways with one continuous ply of prepared roll roofing material, embedded in steep asphalt applied at rate of 25 pounds per square. Roofing sheet shall be of width to extend minimum of 4 inches beyond both sides of walkway area.
- 3.2 Installation:
  - 3.2.1 Installation of Walkways on Flat Surfaces:
    - 3.2.1.1 Wood Bases: Nominal 2-inch by 6-inch wood base members, maximum of 32 inches long, shall be set into solid uniform layer of bituminous cement, 12 inches wide and spaced 48 inches apart. Apply cement over protection course or premolded filler when applied.
    - 3.2.1.2 Securing in Place: Fasten runners to wood base members with metal angle braces or nail in place. Fasteners shall not penetrate through base units into roofing material. Runners shall be 12 feet minimum length, and joints shall occur over wood bases.
    - 3.2.1.3 Walkways: Nail 1-inch by 4-inch boards, spaced maximum 1/2 inch apart, to 2-inch by 4-inch wood runner members standing on edge, spaced maximum 26 inches apart. Walkway boards shall extend maximum of 4 inches over runners at each side. Nail walkway boards to runner with minimum two nails per board.
    - 3.2.1.4 Roof Surfacing: Apply roof surfacing material to roof surface after wood bases are installed and before walkways are fastened in place. Do not apply surfacing material over wood bases, only between and around.
  - 3.2.2 Installation of Walkways on Sloped Surfaces:
    - 3.2.2.1 Runners: Run nominal 2-inch by 4-inch runners, spaced 24 inches apart maximum, directly over prepared roofing strip, and fasten to roof deck with angle fasteners or nailed directly into deck.
    - 3.2.2.2 Walkway Boards: Nail nominal 1-inch by 4-inch boards to runners. Space walkway boards 6 inches on center, nail flush with outside edge of runners, and fasten to each runner with two nails.

END OF SECTION 07510b



## 07000 - Thermal & Moisture Protection

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### SECTION 07510c

#### COMPOSITION TRAFFIC TOPPING

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of composition traffic topping. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation and surface preparation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
  - 2.1 Composition Panels: ASTM D 517.
  - 2.2 Adhesive: ASTM D 2822, asphaltic roofing cement.
  - 2.3 Bitumen: Type used in roofing system.
- 3.0 EXECUTION:
  - 3.1 Preparation: Cut panels at the project site only when necessary to obtain sizes of panels different from those furnished.
  - 3.2 Installation:
    - 3.2.1 Spaced Panels: Space panels maximum of 6 inches apart.
    - 3.2.2 Butted Panels: Butt panels together to form continuous walkway areas.

END OF SECTION 07510c





## SECTION 07530

### ELASTIC SHEET ROOFING

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of elastic sheet roofing. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation and surface preparation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
- 2.1 Roll Roofing: ASTM D 371, Type II, for mineral surfaced; ASTM D 224, Type II, for smooth surfaced.
- 2.2 Elastic Sheet Roofing: Elastic sheet material shall be EPDM, hypalon, neoprene, polyvinyl chloride, chlorinated polyethylene, polyisobutylene, atactic-polypropylene, isotatic-polypropylene or modified bitumen (reinforced or unreinforced), as required. Provide products that are fully compatible with indicated substrates or provide separation materials as required to eliminate contact between incompatible materials. The elastic sheet roofing shall meet the following requirements based on type of installation.
- 2.2.1 For Loose-Laid Ballasted System: Manufacturer's standard thickness but not less than 45 mils, 1,400 psi minimum tensile strength (ASTM D 412), 250 percent elongation (ASTM D 412), vapor permeable, ultraviolet and ozone resistant, low temperature brittleness of -40 F (ASTM D 746).
- 2.2.2 For Mechanically Fastened System: Manufacturer's standard thickness but not less than 60 mils, 1,600 psi minimum tensile strength (ASTM D 412), minimum tear resistance of 150 lbs/lin in (ASTM D 624), 300 percent elongation (ASTM D 412), ultraviolet and ozone resistant, low temperature brittleness of -40 F (ASTM D 746), Standard color.
- 2.2.3 For Fully Adhered System: Manufacturer's standard thickness but not less than 60 mils, 1,400 psi minimum tensile strength (ASTM D 412), 250 percent minimum elongation (ASTM D 412), ultraviolet and ozone resistant, low temperature brittleness of -60 F (ASTM D 746), standard or special color, as required.
- 2.3 Fluid-Applied Roofing: Fluid-applied materials shall be sprayed-in-place urethane roofing with two-coat elastomeric silicone rubber protective coating.
- 2.3.1 Urethane Foam:
- | PROPERTY             | ASTM TEST METHOD | VALUE              |
|----------------------|------------------|--------------------|
| Density, pcf overall | D 1622           | 2.5 min., 3.5 max. |
| Compressive Strength | D 1621           | 40.0 min.          |
| Psi parallel to rise |                  |                    |
| Thermal Conductivity | C177             | new 0.11max.       |
| (k factor) Btu/hr/   |                  | aged 0.15max.      |
| Sq ft/degrees F/in.  |                  | (6 months)         |
- 2.3.2 Elastomeric Protective Coating: Two-coat silicone rubber system, bonded to urethane foam:



## 07000 - Thermal & Moisture Protection

PROPERTY	ASTM TEST METHOD	VALUE
Tensile Strength, psi	D 412	500-600
Elongation percent	D 412	100-150
Hardness	D 2240	45

### 2.4 Roofing Installation Accessories:

#### 2.4.1 Roll Roofing:

2.4.1.1 Roofing Nails shall be 12-gauge galvanized with minimum 3/8-inch diameter head and 7/8-inch long shank.

2.4.1.2 Cement shall be cold process asphalt as recommended by material manufacturer.

#### 2.4.2 Elastic Sheet Roofing:

2.4.2.1 Ballast for Loose-Laid Ballasted Systems shall be washed round riverbed gravel, ranging in size from 3/4 inch to 1-1/2 inches in diameter.

2.4.2.2 Mechanical fasteners used with mechanically fastened system shall be screws, nails, battens, accessory components, and adhesives as appropriate for the substrate.

2.4.2.3 Adhesive for Fully Adhered System shall be compatible with substrate and project conditions and formulated to withstand a minimum 60 psf uplift force.

2.4.2.4 Protective color coat as required for mechanically fastened and fully adhered systems shall be ozone-resistant, liquid-applied hypalon.

2.4.2.5 Flashing material shall be compatible with the membrane.

2.4.2.6 Membrane Seaming System shall be of manufacturer's standard materials for sealing lapped joints, including edge sealer to cover exposed spliced edges.

2.4.2.7 Cant Strips and Flashing Accessories shall be compatible with membrane, including adhesive tapes, flashing cements, and sealants.

2.4.2.8 Slip Sheet for protection of membrane from incompatible substrate shall be as recommended by membrane manufacturer.

2.4.2.9 Walkway Protection Boards, where required, shall be prefabricated concrete pavers containing no asphalt or coal-tar derivatives, suitable for use without cracking or breaking.

2.4.3 Fluid-Applied Roofing: Ceramic granules shall be No. 11 screen size dry and free from dust.

### 3.0 EXECUTION:

#### 3.1 Preparation:

3.1.1 Roll Roofing: Clean wood deck completely. Ensure that all nails are driven flush with or below deck surface. Surface must be dry before placing any roofing material.

3.1.2 Elastic Sheet Roofing: Clean of dust, debris, or other substances detrimental to work. Remove sharp projections. Prime substrate as required.

3.1.3 Fluid Applied Roofing: Clean all debris from roof surface, new or existing. On existing roof, repair any roof damage to provide a clean smooth surface.



## 07000 - Thermal & Moisture Protection

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### 3.2 Installation:

- 3.2.1 Roll Roofing: Install in accordance with the National Roofing Contractors Association Steep Roofing Manual application instructions.
- 3.2.2 Elastic Sheet Roofing and Fluid Applied Roofing: Install in accordance with manufacturer's instructions.

END OF SECTION 07530



## SECTION 07544

### SPRAYED POLYURETHANE FOAM (SPF) ROOFING

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of sprayed polyurethane foam roofing systems. Materials shall match existing materials and/or shall be as directed by the Contracting Officer. Installation and surface preparation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

1.1 Installer shall be a manufacturer approved roofing contractor.

#### 1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

#### AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 1029	(1990) Spray-Applied Rigid Cellular Polyurethane Thermal Insulation
ASTM D 412	(1982) Vulcanized Rubber and Thermoplastic Elastomers - Tension
ASTM D 579	(1990) Greige Woven Glass Fabrics
ASTM D 2240	(1991) Rubber Property - Durometer Hardness
ASTM C177	(1985) Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus

#### FACTORY MUTUAL ENGINEERING AND RESEARCH (FM)

FM-02	(1996) Approval Guide: Fire Protection
FM-04	(1996) Approval Guide: Building Materials

#### UNDERWRITERS LABORATORIES (UL)

UL-01	(1996) Building Materials Directory
UL 790	(1995) Tests for Fire Resistance of Roof Covering Materials
UL 1256	(1993; Rev thru Apr 1996) Fire Test of Roof Deck Constructions

#### 1.3 SYSTEM DESCRIPTION

The roofing system shall consist of a layer of sprayed in-place urethane foam roof insulation covered with an elastomeric protective coating and surfaced with ceramic granules.

#### 1.4 GENERAL REQUIREMENTS

##### 1.4.1 Coordination



## 07000 - Thermal & Moisture Protection

Roofing operations shall be coordinated with work of other trades to ensure that components are installed as required to permit continuous self-flashing of the sprayed polyurethane foam and protective coating system. The installed roofing system shall be protected from damage. Damaged areas shall be repaired.

### 1.4.2 Preparation

Surfaces to receive elastomeric roofing shall be dry and free of loose coatings, surface curing agents, dust, wax or other contaminants. Workmen shall wear clean, soft-soled, sneaker-type shoes.

### 1.4.3 Protection of Adjacent Surfaces

Surfaces near roofing operations shall be protected from spray of roofing materials.

### 1.5 SUBMITTALS

The following shall be submitted for approval as directed by the Contracting Officer

#### SUBMITTAL PROCEDURES:

SD-06 Instructions

Manufacturer's instructions for installation of the roofing system.

SD-13 Certificates

Certificates of compliance attesting that the foam and protective coating materials meet the specified requirements, and that the proposed roofing system has been tested and meets the requirements of Class A system in accordance with UL 790. In lieu of certificates, labels on the containers of foam and protective coating or listing by Underwriters Laboratories will be acceptable as evidence that the elastomeric roofing materials conform to these requirements.

SD-14 Samples

Samples of the following materials:

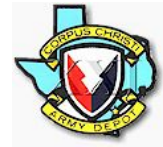
Urethane foam	4.0 L (1 gallon) each component
Protective Coating	1.0 L (1 quart) each component
Foam Finish Texture	2 samples, each 600 mm (2 feet) square
Ceramic Granules	Sample of each color

### 1.6 DELIVERY, STORAGE, AND HANDLING

Materials shall be delivered to the jobsite in their original unopened packages, clearly marked with the manufacturer's name, brand name, and description of contents. Materials shall be stored in clean, dry areas, away from excessive heat, sparks, and open flame. Storage area shall be ventilated to prevent build-up of flammable gases. Not more than half the shelf life shall have expired when materials are applied.

### 1.7 FIRE AND WIND UPLIFT

The complete roof system shall have a UL 1256, Or UL 790, Class A or B classification, be listed as "fire classified" in UL-01, and bear the UL label or be listed as a Class I Roof Deck in FM-02 as directed by the Contracting Officer.



## 07000 - Thermal & Moisture Protection

Roofing system over steel deck shall be rated Class I- 60, 90, 105, 120 in accordance with FM-04 as directed by the Contracting Officer. Ratings from other independent laboratories may be substituted provided that the tests, requirements and ratings are documented to be equivalent, to the satisfaction of the the Contracting Officer.

### 1.8 WARRANTY

Manufacturer's standard warranty for the roofing system shall be provided for not less than 10 years from acceptance of the work. Warranty shall state that manufacturer shall repair or replace defective materials if the roofing system leaks or allows the insulation beneath the membrane to become wet during the period of the warranty.

### 2.0 PRODUCTS :

#### 2.1 URETHANE FOAM

Urethane foam shall be standard product of the manufacturer, and containers shall be factory marked with the manufacturer's name or trademark. The cured foam shall meet requirements of ASTM C 1029 Type III or IV.

#### 2.2 PROTECTIVE COATING

Coating shall consist of three coats of one-component silicone, or three coats of two-component silicone, or three coats of two-component urethane-aromatic, or base and intermediate coats of two-component urethane-aromatic with two-component urethane-aliphatic top coat, or three coats of acrylic latex. Top coat shall be white or light gray color. Coating shall bond to urethane foam and shall have the following minimum properties:

#### \* MINIMUM PROPERTIES

MATERIAL	No. of Components	Tensile MPa	Elongation Percent	Hardness Type A
Silicone	one	2.76	150	45
Silicone	two	3.45	100	45
Urethane-aromatic	two	6.89	400	60
Urethane-aliphatic	(top-coat only)			
Urethane-aromatic	two	11.03	150	80
Urethane-aromatic	(base and intermediate coating only)			
Urethane-aliphatic	one	2.76	500	50
Urethane-aromatic	(top coat only)			
Urethane-aliphatic	one	13.79	450	80
Acrylic	one	1.03	265	45



### \* MINIMUM PROPERTIES

MATERIAL	No. of Components	Tensile Psi	Elongation Percent	Hardness Type A
Silicone	one	400	150	45
Silicone	two	500	100	45
Urethane- aromatic	two	1000	400	60
Urethane- (top coat only) aliphatic	two	1600	150	80
Urethane- (base and intermediate coating only) aromatic	one	400	500	50
Urethane- (top coat only) aliphatic	one	2000	450	80
Acrylic	one	150	265	45

\* Minimum properties specified above shall be determined as follows:

Tensile strength and elongation: ASTM D 412 Die C, at 24 degrees C. (75 degrees F.)  
Hardness: ASTM D 2240, Type A.

### 2.3 CERAMIC GRANULES

Ceramic granules shall be No. 11 screen size, color as selected, dry, and free from dust.

### 2.4 SEALANTS

Sealants shall be as recommended by the coating manufacturer.

### 2.5 FABRIC

Fabric shall be ASTM D 579, style 1620.

### 3.0 EXECUTION:

Installation shall comply with the manufacturer's instructions including minimum thickness, except as otherwise specified. Concrete surfaces shall be cured a minimum of 30 days prior to application of foam.

#### 3.1.1 Urethane Foam



## 07000 - Thermal & Moisture Protection

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Foam shall be sprayed on the prepared surface in 13 to 25 mm (1/2 to 1 inch) lifts. Time between lifts shall not exceed 4 hours. The finished surface shall be "verge of popcorn" or smoother. An approved sample shall be used as the standard for determining the acceptability of the foam finish. Foam shall be extended up walls and around roof projections to form cants and flashings that terminate at least 50 mm (2 inches) above finished roof surface. Cured foam shall be free from water, dust, oils, and other materials which would impair adhesion of the protective coating. No foam shall be allowed to stand overnight without a base protective coating. Foam shall cure at least 1 hour, unless otherwise recommended by the manufacturer before application of protective coating. Any nonadherence of foam to substrate shall be corrected and pinholes shall be finished flush with an approved sealant before finish coating is applied. Overspraying to correct an unacceptable surface condition will not be permitted. The finished roof surface shall not vary more than 13 mm (1/2 inch) when measured with a 3 m (10 foot) straight edge parallel and perpendicular to the roof slope.

### 3.1.2 Protective Coating

Coating shall consist of base, intermediate, and top coats. Coatings shall be spray applied, unless otherwise approved. Coating shall completely cover the foam and extend up vertical surfaces 50 mm (2 inches) beyond foam. The color of each coat shall contrast with the previous coat. Base or intermediate coats exposed for more than 24 hours shall be cleaned, thoroughly rinsed and dried, then given another covering of base coating before applying the top coat. No traffic will be allowed on finished areas for 24 hours after installation.

#### 3.1.2.1 Base and Intermediate Coats

Base and intermediate coats shall each have dry film thicknesses of not less than 0.25 mm (10 mils) for silicones, or 0.375 mm (15 mils) for urethane or acrylic coating. Coating shall be dry and clean before application of top coat.

#### 3.1.2.2 Top Coat

Top coat shall be white or light gray color. Top coat shall be applied at right angles to the directions of the base coat application and shall fully cover the base coat. Top coat dry film thickness shall be not less than 0.25 mm. (10 mils.)

#### 3.1.2.3 Penetrations

An additional 0.38 mm (15 mils) of coating shall be applied for 900 mm (3 feet) around roof access locations and 600 mm (2 feet) around all other roof penetrations. Thickness of coating at drain sumps shall be double that on the rest of the roof.

### 3.1.3 Granules

Granules shall be applied within 5 minutes of top coat application, using pressure equipment, at a rate of 1.95 kg (40 pounds) per 9 square meters. (100 square feet.) Granules shall be applied in a minimum of two passes made at right angles to each other. Finished granule system shall be uniform over entire surface with no apparent void areas.

### 3.1.4 Service Walks

Service walks shall be applied after the protective coating system has been completed and cured. Walks shall consist of an extra coating system application or nonwoven fiberglass fabric as indicated. Fabric shall be smoothed with brush or roller into an additional layer of protective coating; then a





## 07000 - Thermal & Moisture Protection

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complete coating system shall cover the fabric and a minimum of 150 mm (6 inches) beyond each edge of the fabric. Top coat shall be covered with roofing granules as specified.

### 3.2 EQUIPMENT CALIBRATION

Spray equipment for two-component systems shall be calibrated each day at start of operations, after each restart if spraying operations have been terminated for more than 1 hour, whenever there is a change in fan pattern or pressure, whenever slow curing areas are noticed, whenever a change is made in hose length or working height and after changeover between materials. Calibration shall consist of demonstrating that the equipment is adjusted to deliver components in the proper proportions. Calibration tests shall be done on cardboard or plywood on the roof adjacent to the area to be sprayed.

### 3.3 PREPARATION

- A. Surfaces to receive elastomeric roofing: Dry and free of loose coatings, surface curing agents, wax or other contaminants.
- B. Workmen shall wear clean, soft-soled sneaker-type shoes.

### 3.4 PROTECTION OF ADJACENT SURFACES

Protect surfaces near roofing operations from spray or roofing materials.

END OF SECTION 07544



## 07000 - Thermal & Moisture Protection

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### SECTION 07550

#### INVERTED ROOF SYSTEMS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of inverted roof systems. Materials shall match existing materials and/or shall be as directed by the Contracting Officer. Installation and surface preparation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.1 Installer shall be a manufacturer approved roofing contractor.
- 1.2 Roofing System (Materials and Workmanship) shall be guaranteed in writing, for 10 years by the manufacturer.
- 2.0 PRODUCTS :
  - 2.1 Asphalt Primer: ASTM D 41.
  - 2.2 Fiberglass Base Sheet: Glass fiber mat coated with weathering grade asphalt to provide a nonporous ply.
  - 2.3 Fiberglass Felt: ASTM D 2178, Type IV.
  - 2.4 Sheathing Paper: Single-ply 5 lb/100 sq ft, rosin-sized sheathing paper.
  - 2.5 Base for Built-Up Membrane Applied Over Steel Deck shall be one of the following with mechanical attachment:
    - 2.5.1 Mineral Fiberboard: ASTM C 726, 3/4 inch thick.
    - 2.5.2 Wood Fiberboard: Organic fiberboard roof insulation, 1 inch thick. Submit Manufacturer's Data for approval.
    - 2.5.3 Gypsum Wallboard: 1/2 inch thick, ASTM C 36.
  - 2.6 Steep Asphalt: ASTM D 312, Type III.
  - 2.7 Extruded Rigid Polystyrene Insulation: ASTM C 578, Type IV, 24-inch by 48-inch standard size, with drainage channel on bottom of each board.
  - 2.8 Galvanized Roofing Nails: 11 gauge, barbed, galvanized with 7/16-inch to 5/8-inch diameter heads or other approved type.
  - 2.9 Fabric for Application Above Insulation: 3 oz/sq yd black polyester or 3 oz. /sq yd black polypropylene approved by inverted roof system manufacturer.
  - 2.10 Ballast: Gravel or crushed stone shall be in accordance with ASTM D 448, Gradation No. 57. The average size of gravel shall be 3/4 inch, with none smaller than 1/2 inch, (no fines).



## 07000 - Thermal & Moisture Protection

- 2.11 Walkway Pavers: Precast concrete, pedestal type, 8,000 P.S.I. compressive strength, 2 foot square maximum weight of 100 lbs.
- 3.0 EXECUTION:
- 3.1 Installation on Various Deck Materials:
  - 3.1.1 On lightweight insulating concrete decks, prime concrete surface with asphaltic primer.
  - 3.1.2 On poured gypsum decks, lay one ply of approved fiberglass base sheet with edges lapped and nailed with nails approved for use with gypsum deck materials.
  - 3.1.3 On precast concrete plank deck or precast concrete tee deck, prime concrete surfaces with asphalt primer. Prior to applying built-up roof membrane, apply 18-inch wide slip sheet of 2-ply dry-applied fiber-glass felt to cover end joints where concrete planks or tees meet.
  - 3.1.4 On wood decks, cover the deck with sheathing paper lapping and mechanically fastening each sheet to the deck. Over Sheathing paper, apply one ply of approved fiberglass base sheet, lapping joints and nailing, using galvanized roofing nails driven through flat metal disks not less than 1 inch in diameter.
- 3.2 Builtup Roof Membrane Installation:
  - 3.2.1 Starting at low point of roof, uniformly mop the surface of the nailed fiberglass base sheet or primed deck surface with steep asphalt at the rate recommended for substrate ( $25 \pm 5$  to  $30 \pm 5$  lbs per square). While hot, embed 3 plies of approved fiberglass felts in shingle fashion, lapping each sheet 24-2/3 inches.
  - 3.2.2 Interply moppings shall be continuous and applied at the rate listed above for substrate. Complete embedment of felts is required and is accomplished by dragging a broom or squeegee over the felt; no more pressure is required than that exerted by the weight of the "brooming" utensil. During cold weather, effective brooming is essential to eliminate voids and to ensure adhesion. As the work progresses, full mop the top surface of the membrane using a minimum coverage of  $25 \pm 5$  lbs per square. A second flood coat shall be applied at the rate of 45 lbs per square.
  - 3.2.3 At no time shall felts be left exposed overnight or in inclement weather. All mopping bitumen shall be steep asphalt (Type III, 185-205 F softening point).
  - 3.2.4 Bitumen temperature at the kettle shall be controlled so as not to exceed the bitumen manufacturer's recommendations. The roof membrane shall not be staged. Temporary membranes are not acceptable as a part of a completed membrane. Install completed membrane in final form on a day-to-day basis. .
- 3.3 All Flashing Shall Be Completed in each area prior to installing roof insulation. Details and installation shall conform to standard inverted roof system specifications.
- 3.4 Unadhered Insulation Installation:
  - 3.4.1 General: rigid polystyrene insulation shall be placed on the membrane as the membrane is completed to provide immediate protection. Flood coats of steep asphalt shall be allowed to cool completely prior to rigid insulation installation to ensure unadhered foam.
  - 3.4.2 Rigid polystyrene insulation shall be placed directly on membrane with channel side down. End joints shall be staggered and all boards shall be tightly abutted. The maximum acceptable opening



## 07000 - Thermal & Moisture Protection

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between boards shall be 3/8 inch. Install insulation to within 3/4 inch of all projections and cant strips. For multilayer installations, install subsequent layers unattached over the unadhered first layer. Stagger all joints in relation to underlying layer. The bottom layer shall be as thick or thicker than the top layer and must be a minimum of 2 inches thick.

- 3.4.3 Fabric Installation: Place fabric over rigid insulation, unadhered and unattached. Fabric shall be wetted to hold it in place until ballast is installed, Edges shall be overlapped a minimum of 1 foot. Install so that there are no parallel joints within 6 feet of the perimeter. Extend fabric 2 to 3 inches above the stone at perimeter and penetrations.
- 3.4.4 Thickness of Insulation: Installed thickness shall provide a u-value through completed roof structure, air-to-air, not in excess of that required by job location, as determined for winter conditions in accordance with recognized methods in agreement with ASHRAE Handbook Fundamentals.
- 3.5 Ballast Installation:
  - 3.5.1 General: Fabric shall be covered with gravel or crushed stone ballast as the fabric is being installed. The stone top covering shall be 3/4 inch with not less than 10 percent nor more than 60 percent of fines smaller than 1/2 inch.
  - 3.5.2 Stone or gravel ballast shall be applied at a minimum average rate of 1,200 lbs per square. Around roof perimeter and at penetrations and drains, 2400/Square ft of stone ballast over a 4 foot wide area shall be applied. A continuous row of pavers constituting 22 lbs/lin ft can be substituted for the extra ballast around perimeter, penetrations and drains. Pavers shall be used in high traffic areas near roof and equipment access areas.

END OF SECTION 07550



## SECTION 07600

### SHEET METAL

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of sheet metal. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation and surface preparation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS: Materials and fabrication shall comply with applicable recommendations and details of SMACNA Architectural Sheet Metal Manual.
- 2.1 Shop- and Job-Fabricated Sheet Metal Items may include the following:
- a. Downspouts with clips, anchors, straps, and leaders.
  - b. Edge strip.
  - c. Flashings, including base, cap, eave, stepped, valley, apron, collar, through-wall and coping flashings.
  - d. Gravel stops and fascias, extruded or formed.
  - e. Gutters, with continuous cleats, hangers, and cover plates.
  - f. Louvers.
  - g. Pitch pans.
  - h. Reglets.
  - i. Scuppers.
  - j. Splash pans.
  - k. Roofing, including batten seam, flat seam, standing seam, and bermuda seam types.
- 2.2 Aluminum:
- 2.2.1 Mill Finished Sheets: ASTM B 209, Alloy 3003, temper H14.
- 2.2.2 Colored Sheets: ASTM B 209, alloy Alclad 3003, temper H14.
- 2.3 Brass: ASTM B 36, copper alloy No. 260, rolled half-hard temper.
- 2.4 Copper: ASTM B 370, light cold-rolled temper, mill finish.
- 2.5 Lead Coated Copper: Cold-rolled sheet copper complying with ASTM B 370, coated with not less than 0.06 pounds per square foot of lead per side. Lead coating shall comply with ASTM B 101, Type I.
- 2.6 Stainless Steel: ASTM A 167, corrosion-resistant steel, annealed, AISI Type 301, No. 1 finish.
- 2.7 Copper Clad Stainless Steel: ASTM B 506, stainless steel sheet metal, coated with metallurgically-bonded cladding of copper on each face mounting to 10 percent of thickness (80 percent stainless steel, 20 percent copper). Core shall comply with ASTM A 176, AISI Type 430. Copper cladding shall have mill finish.



## 07000 - Thermal & Moisture Protection

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- 2.8 Lead-Coated Copper Clad Stainless Steel: ASTM B 506, copper clad stainless steel sheet metal, coated on one side with 0.06 pounds per square foot of lead complying with ASTM B 101, Type I.
- 2.9 Terne-Coated Stainless Steel: Stainless steel core complying with ASTM A 167, AISI Type 304, with terne coating of 20 percent tin and 80 percent lead on both faces.
- 2.10 Terne-Coated Steel: Commercial quality steel sheet core with 1.45 ounces coating of 20 percent tin and 80 percent lead on both faces.
- 2.11 Galvanized Steel: ASTM A 526, commercial quality carbon steel sheets with minimum 0.20 percent copper content, hot-dipped galvanized to comply with ASTM A 525, G 90 coating designation. Galvanized steel designated to be finished shall be mill phosphatized and coated with manufacturer's standard baked-on finish.
- 2.12 Zinc-Alloy: ASTM B 69, containing not less than 0.6 percent copper and 0.14 percent titanium, standard temper.
- 2.13 Lead Sheet: Formed from common desilverized pig lead, complying with ASTM B 29.
- 2.14 Fasteners:
  - 2.14.1 General Use Fasteners: Same material as sheet metal to which attached, or as recommended by sheet metal manufacturer.
  - 2.14.2 Fasteners for Copper Items: Bronze, brass, or copper types.
  - 2.14.3 Fasteners for Aluminum:
    - 2.14.3.1 Rivets: ASTM B 316, alloy 1100, temper H14, minimum shank diameter of 0.187 inch, length as required to form a head.
    - 2.14.3.2 Screws and Bolts: ASIM B 211, alloy 6061, temper as appropriate for particular use.
    - 2.14.3.3 Washers: Alloy 1100, temper H18 or same aluminum alloy as aluminum sheet or fasteners being used.
    - 2.14.3.4 Noncorrosive Fasteners: Stainless steel, AISI Type 304.
    - 2.14.3.5 Cleats: Formed of same material and thickness as sheet metal being installed, minimum 2 inches wide and long enough to be fully incorporated into work.
- 2.15 Solder: ASTM B 32, of type best suited for intended purpose.
- 2.16 Welding Electrodes:
  - 2.16.1 Aluminum: Welding electrodes and filler alloy of type best suited for alloy of aluminum being welded. Paste flux shall be used in welding aluminum.
  - 2.16.2 Stainless Steel: Type recommended by stainless steel producer for type of metal sheet furnished.
- 2.17 Burning Rods for Lead shall be same composition as lead sheet.
- 2.18 Miscellaneous Materials:
  - 2.18.1 Felt: ASTM D 226, No. 15 asphalt-saturated organic felt, unperforated.
  - 2.18.2 Sheathing Paper: Rosin-sized paper weighing not less than 6 pounds per square.



## 07000 - Thermal & Moisture Protection

- 2.18.3 Bituminous Plastic Cement: Type I for use with asphaltic roofing materials and Type II for use with coal-tar roofing materials.
- 2.18.4 Bituminous Coating: Cold-applied solvent type bituminous mastic coating for application in minimum dry film thickness of 12 mils per coat. Submit Manufacturer's Data for review.
- 2.18.5 Primer Paint: Alkyd type zinc chromate.
- 2.18.6 Zinc Dust Paint: MIL-P-21035 galvanized sheet metal touchup paint.
- 2.18.7 Sealants: Non-drying mastic type as recommended for particular joint being sealed and anticipated movement within joint. Submit manufacturer's data for review.
- 2.18.8 Wood Nailers and Edge Blocking: Non-stress graded wood members, moisture-resistant, treated with waterborne preservative in compliance with AWPB LP-2 standard. Nominal dimensions of nailers shall be 1 inch by 3 inches, unless otherwise required.
- 2.18.9 Nonmetallic Through-Wall Flashing: Nonreinforced, homogeneous, waterproof impermeable elastomeric sheeting having not less than 1,000 psi tensile strength nor more than 7 percent tension set at 50 percent elongation when tested in accordance with ASTM D 412. Sheeting shall resist exposure without visible deterioration when tested not less than 400 hours in accordance with ASTM D 822. Sheeting shall not crack or flake when exposed to low temperatures.
- 2.18.10 Miscellaneous Sheet Metal Roofing Materials:
  - 2.18.10.1 Wood Batten Strips shall be non-stress graded wood members of nominal 2 inches by 2 inches, pressure-treated with waterborne preservatives in compliance with AWPB LP-2, or other material that is compatible with sheet metal.
  - 2.18.10.2 Polyethylene underlayment shall be a minimum of 6 mil chlorinated polyethylene film.
- 3.0 EXECUTION: Installation of sheet metal materials shall comply with applicable recommendations and details of SMACNA Architectural Sheet Metal Manual.
- 3.1 Nailing Strips and Edge Blocking: When deck surface is non-nailable, nailing strips and edge blocking shall be, installed over surface of deck for anchorage of sheet metal materials.
- 3.2 Substrate Conditions: Surfaces to receive sheet metal materials shall be even, smooth, sound, thoroughly clean and dry, and free from defects that might effect application.
- 3.3 Fasteners shall be concealed wherever possible in exposed work.
- 3.4 Dissimilar Surfaces:
  - 3.4.1 Separate dissimilar metals by painting each metal surface in areas of contact with bituminous coating, or provide a layer of water-proof sheathing paper or asphalt coated felt between contact surface.
  - 3.4.2 Separate metal items from treated wood and cementitious materials with bituminous coating, applied either to substrate or metal.
  - 3.4.3 Aluminum shall not be used when it will be in contact with copper or where it will contact water that flows over copper surfaces. Protect aluminum surface in contact with wet or pressure treated wood, cementitious materials, or ferrous metals from galvanic or corrosive action by applying one coat of zinc chromate primer and one coat of aluminum paint, or by placing layer of nonabsorbitive tape or gasket between adjoining surfaces.



## 07000 - Thermal & Moisture Protection

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- 3.4.4 Where asphalt-saturated felt has been applied under sheet metal that will be soldered or welded, cover felt with one layer of sheathing paper before installing sheet metal.
- 3.5 Sheet Metal Roofing:
  - 3.5.1 Removing Existing Sheet Metal Roofing: Remove sheet metal roofing in full sections or cut damaged sections where possible to make watertight joints between existing roofing and new materials to be installed.
  - 3.5.2 Preparing Existing Surfaces: Bent or raised portions of existing roofing shall be nailed down and repaired to extent necessary.
  - 3.5.3 Application of Underlayment:
    - 3.5.3.1 Felt Underlayment: Apply one layer of asphalt-saturated roofing felt over deck surface and cover with one layer of sheathing paper. Underlayment plies shall be installed with mechanical fasteners spaced 6 inches in center at laps or adhesives as appropriate for substrate conditions.
    - 3.5.3.2 Polyethylene Film Underlayment: Install one layer of polyethylene film underlayment over deck surface with adhesive. Cover polyethylene film with one layer of sheathing paper applied with adhesive. Mechanical fasteners shall be installed only where deck surface presents nailable conditions.
  - 3.5.4 Coating Backside of Metal Sheets:
    - 3.5.4.1 Bituminous Coating: Coat back side of metal roofing with bituminous coating wherever metal will be in contact with wood, ferrous metal, or cementitious construction.
    - 3.5.4.2 Painting: Paint back side of metal roofing with zinc chromate type primer, minimum 2-mil dry film thickness.
  - 3.5.5 Expansion Seams: Provide loose lock or slip seams, as designated. Seams shall allow 1/2-inch for expansion and shall be sealed with sealant.
  - 3.5.6 Penetrations Through Roofing shall be flashed with sheet metal material to match roofing material.

END OF SECTION 07600





## SECTION 07800

### ROOF ACCESSORIES

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of heat and smoke vents, roof hatches, gravity ventilators, prefabricated curbs and equipment supports, and curb-set expansion joints. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation and surface preparation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS: Comply with SMACNA Architectural Sheet Metal Manual details for fabrication of units, including flanges and capflashing to coordinate with type of roofing indicated.
- 2.1 Zinc-Coated Steel: Commercial quality with 0.20 percent copper, ASTM A 525, G90 hot-dip galvanized, mill phosphatized.
- 2.2 Stainless Steel: AISI Type 302/304, ASTM A 167, 2D annealed finish except as otherwise indicated, tempered as required for forming and performance.
- 2.3 Aluminum Sheet: ASTM B 209, Alloy 3003, tempered as required for forming and performance; AA-C22A4I clear anodized finish, except mill finish prepared for painting where designated for field painting.
- 2.4 Extruded Aluminum: Alloy 6063-T52; 0.078 inch minimum thickness' for primary framing and curb member legs, 0.062 inch for secondary legs; AA-C22A4I clear anodized finish on exposed members, except as otherwise designated.
- 2.5 Insulation: Rigid or semi-rigid board of glass fiber.
- 2.6 Wood Nailers: Softwood lumber, pressure-treated with water-borne preservatives for above ground use, complying with AWPB LP-2; nor less than 1-1/2 inches thick.
- 2.7 Fasteners: Same metal as metals being fastened, or nonmagnetic stainless steel or other noncorrosive metal. Match finish of exposed fasteners with finish of material being fastened. Where removal of exterior exposed fasteners affords access to building, provide non-removable fastener heads.
- 2.8 Gaskets: Tubular or fingered design of neoprene or polyvinyl chloride, or block design of sponge neoprene.
- 2.9 Bituminous Coating: SSPC-Paint 12, solvent type bituminous mastic, nominally free of sulfur, compounded for 15-mil dry film thickness per coating.
- 2.10 Mastic sealant: Polyisobutylene; nonhardening, nonskinning, nondrying, nonmigrating sealant.
- 2.11 Elastomeric Sealant: Type that is compatible with joint surfaces.
- 2.12 Roofing Cement: ASTM D 2822, asphaltic.



## 07000 - Thermal & Moisture Protection

- 2.13 Prefabricated Heat/Smoke Vents: Provide units that have been tested, listed, and labeled by UL (Class A) or FM, as designated, Except as otherwise designated, fabricate for 40 lbs/sq ft external loading and 20 lbs/sq ft internal loading pressure. Fabricate framing of the following materials as designated, with manufacturer's standard welded or sealed mechanical corner joints, including cap flashing:
- a. Formed or extruded aluminum.
  - b. Zinc-coated steel.
  - c. Formed or extruded aluminum or zinc-coated steel.
- 2.13.1 Hatch-Lid Type Units: Fabricate with single or double aluminum covers with 1 inch integral insulation and gaskets. Equip units with automatic self-lifting mechanisms and fusible links or other heat-sensitive or smoke-sensitive release devices as indicated, and with complete hardware including hold-open devices and independent manual release devices for inside and outside operation of covers.
- 2.13.2 Fusible-Dome Type Units: Provide manufacturer's standard shrinkback/drop-out sheet dome unit for 210 F activation; with light transmittance of 40 percent, proven 10-year weather resistance, exterior acrylic protective coating, and maximum flame spread rating of 25 (UL 723). Equip each unit with external safety grid capable of supporting 200 pound loading. Provide glazing system for easy replacement of activated domes and for drainage of condensation to exterior.
- 2.14 Prefabricated Roof Hatches: Fabricate units as single-leaf Type unless otherwise directed, for 40 lbs/sq ft external loading and 20 lbs/sq ft internal loading pressure. Frame with 9-inch high integral-curb double-wall construction with 1-1/2 inch insulation, cant strips, and cap flashing, with welded or sealed mechanical corner joints. Provide double-wall cover construction with 1 inch insulation core. Equip units with complete hardware set including hold-open devices, interior padlock hasps, and both interior and exterior latch handles. Provide gasketing. Fabricate units of following materials as designated:
- a. Aluminum sheets and extrusions.
  - b. Zinc-coated steel sheets.
  - c. Zinc-coated steel sheet curbs and aluminum covers.
  - d. Aluminum or zinc-coated steel, or in combination.
- 2.15 Louvered Penthouse Gravity Ventilators: Provide units fabricated with weatherproof aluminum extrusion louvered walls with mitered or boxed corner construction; with aluminum sheet cover and 1 inch insulation adhesively applied on underside; and with extruded aluminum base and cap flashing for mounting on curbs which are not integral with units. Equip units with manual dampers designed for operation from floor directly below ventilator unit. Equip unit with bird or insect screens as directed, located internally to discourage nesting.
- 2.16 Prefabricated Vertical-Type Gravity Ventilators: Provide units fabricated from the following materials and including the following features, as designated:
- a. Zinc-coated steel sheet, prime painted.
  - b. Aluminum sheet, prime painted.
  - c. Aluminum sheet, mill finish.
  - d. Equip with bird screens.
  - e. Equip units with dampers, with manual operation device extended to 6 ft 6 in above floor.
- 2.17 Prefabricated Curbs/Equipment Supports: Comply with loading and strength requirements designated where units support other work. Coordinate dimensions with rough-in sheets or shop drawings of



## 07000 - Thermal & Moisture Protection

equipment to be supported. Fabricate of structural quality sheet steel (ASTM A 570) that has been prepared for painting, factory-primed, and painted with 2-mil thickness of baked-on synthetic enamel, after fabrication. Fabricate with welded or sealed mechanical corner joints and with cant strips and base profile coordinated with roof insulation thickness. Except as otherwise designated or required for strength, fabricate units of minimum 14-gauge metal and to minimum height of 12 inches.

- 2.18 Curb-Set Expansion Joints: Provide extrude aluminum expansion joint units designed for installation on raised curbs. Equip with curb cap, cap flashing, and waterproof bellows of 30- or 60-mil elastic flashing sheet of neoprene, EPDM, butyl rubber, or chlorinated polyethylene. Provide mineral-fiber insulation, concealed under curb cap between curbs, to form a waterproof, airtight, insulated, expansion joint system. Provide units in styles required for roof-to-roof, roof-to-wall, and wall-to-wall applications as required; complete with prefabricated corner and intersection units as required; equipped with special field-splice provisions to ensure permanent continuous waterproof installation of expansion joint system.
- 3.0 EXECUTION: Anchor units securely to supporting structural Substrates, adequate to withstand lateral and thermal stresses as well as inward and outward loading pressures. Except as otherwise designated, install roof accessory items in accordance with construction details of NRCA Roofing and Waterproofing Manual.
- 3.1 Isolation: Where metal surfaces of units are to be installed in contact with noncompatible metal or corrosive substrates, including wood, apply bituminous coating on concealed metal surfaces or provide other permanent separation.
- 3.2 Flange Seals: Except as otherwise directed, set flanges of accessory units in a thick bed of roofing cement to form a seal.
- 3.3 Cap Flashing: Where cap flashing is required as component of accessory, install to provide adequate waterproof overlap with roofing or roof flashing. Seal with thick bead of mastic sealant, except where overlap is required to be left open for ventilation.

END OF SECTION 07800



## 07000 - Thermal & Moisture Protection

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### SECTION 07811

#### PLASTIC SKYLIGHTS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of plastic skylights. Products shall, match existing materials and/or shall be as directed by the Contracting Officer. Installation and surface preparation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS.
  - 2.1 Single Thickness Plastic Skylights shall be formed to a standard dome profile.
  - 2.2 Double Thickness Plastic Skylights shall have an average 1-inch minimum air space between sheets formed to a standard dome profile, with a standard hermetic edge seal.
  - 2.3 Color: Exterior sheets shall be colorless transparent sheet or bronze tinted transparent sheet, 25-30 percent light transmittance in accordance with ASTM D 1003. Interior sheets shall be colorless transparent sheet.
  - 2.4. Glazing frame, Dome retainers, and trim shall be extruded aluminum.
  - 2.5 Curb frame shall be extruded aluminum including cap flashing to receive roofing counterflashing.
    - 2.5.1 Curb-mounted units shall be designed for installation on nominal 1-1/2 inch thick wood curbs.
    - 2.5.2 Insulated curb units shall be self-flashing units with integral, self-supporting double wall formed or extruded or combination aluminum curb, 0.040-inch minimum sheet thickness enclosing minimum 1-inch glass fiberboard or equivalent insulation and with minimum 3-inch roof flanges; welded or sealed mechanical joints at corners.
    - 2.5.3 Curb height shall be 9 inches minimum above line of roofing or custom height as required. For decks that slope 1/4 inch per ft, tapered curb heights shall match slope to provide a level installation of domes.
  - 2.6 Glazing systems of neoprene, closed cell sponge neoprene, partially vulcanized butyl tape, or liquid-applied elastomeric sealant shall be provided.
  - 2.7 Condensation control on inside of domes shall be provided using fabricated units with integral internal gutters and nonclogging weeps.
  - 2.8 Plastic for skylights shall be cast acrylic with abrasion-resistant coating, exterior surface, for 2 percent maximum haze increase of 100 revolution on 500 g Taber abraser in accordance with ASTM D 1044; 14,500 psi flexural strength; 180° F continuous service temperature or cast polycarbonate with 13,500 psi flexural strength; 240° F continuous service temperature; 16 ft-lb IZOD impact strength. Skylights shall meet AAMA 1601.1 recommendations for thickness of plastic domes to maintain 60 psf loading (for support of ice and snow only).



## 07000 - Thermal & Moisture Protection

- 2.9 Bituminous coating shall be in accordance with ASTM D 173 solvent type bituminous mastic, nominally free of sulphur, compounded for 15-mil dry film thickness per coating.
- 2.10 Roofing cement shall be asphaltic complying with ASTM D 2822.
- 2.11 Mastic sealant shall be polyisobutylene; non-hardening, non-skinning, non-drying, non-migrating sealant.
- 3.0 EXECUTION:
- 3.1 Installation of Skylights shall be coordinated with installation of roof deck or other substrates and with vapor barriers, roof insulation, roofing, and flashing as required to ensure that combined elements are waterproof and weathertight. Units shall be anchored securely to supporting structural substrates to withstand lateral and thermal stresses including inward and outward loading pressures.
- 3.2 Isolation: Where metal surfaces of units are required to be installed in contact with noncompatible metal or corrosive substrates, including wood, apply bituminous coating on concealed metal surfaces, or provide other permanent separation.
- 3.3 Flange Seals: Where required, set flanges of accessory units in a thick bed of roofing cement to form a seal.
- 3.4 Cap Flashing: where cap flashing is required, install to provide adequate waterproofing overlap with roofing or roof flashing (as counter flashing). Seal with thick bead of mastic sealant, except where overlap is indicated to be left open for ventilation.
- 3.5 Cleaning: Clean exposed metal and plastic surfaces.
- 3.6 Before the ceiling adjacent to the skylight is furred, or when directed by the Contracting Officer, the skylight shall be flooded with water, and should any leaks develop they shall be made tight by the contractor.

END OF SECTION 07811



## 07000 - Thermal & Moisture Protection

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### SECTION 07812

#### METAL-FRAMED SKYLIGHTS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of metal-framed skylights. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation and surface preparation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
  - 2.1 Metal-Framed Skylight Panels shall be 2-3/4 inch thick double-faced panels consisting of glass fiber reinforced polymer, with interior and exterior faces bonded under controlled heat and pressure to a mechanically interlocked aluminum grid core. Exterior face shall have a special erosion protective surfacing.
    - 2.1.1 Panel Performance Characteristics:
      - 2.1.1.1 Color Stability from Weathering: Exterior face shall not change more than 3.5 adams units (Delta E by ASTM D 2244) .
      - 2.1.1.2 Interior Fire Resistance Characteristics shall be in accordance with ASTM E 84, with flame spread of 45 maximum and a smoke developed rating of 350 maximum.. Burn extent shall be 1 inch or less by ASTM D 635.
      - 2.1.1.3 Exterior Face Impact Resistance shall be 60 ft-lb minimum.
      - 2.1.1.4 Coefficient of Linear Expansion shall be  $1.24 \times 10^{-5}$  in./in./F.
    - 2.1.2 Laminate Adhesive shall be heat and pressure resin type. Minimum strength shall be 750 psi tensile strength by ASTM C 297 after two exposures to six cycles each of aging conditions prescribed by ASTM D 1037 and 500 psi shear strength average by ASTM D 1002 after five prescribed exposures.
    - 2.1.3 Grid Core shall be 6063-T6 aluminum I-beams with 7/16-inch. flange width, mechanically interlocked to ensure even muntin to muntin intersection.
    - 2.1.4 Aluminum Frame shall be 6063-T5 aluminum with mill finish or corrosion-resistant finish as required with mitered and heli-arc welded corners. Clamp fasteners shall be stainless steel.
    - 2.1.5 Panel U-Values determined by ASTM C 236 shall be as designated.
  - 2.2 Pre-Engineered Self-Supporting Roof Systems shall be one of the following standard types as required:
    - 2.2.1 Continuous Vaulted type shall be semi-circular.
    - 2.2.2 Pyramid type shall be self-supporting.
    - 2.2.3 Grid type shall be 4-foot minimum width by 16-foot maximum length as required.



## 07000 - Thermal & Moisture Protection

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- 2.2.4 Structural Roof Design Loads shall be based on location of installation. Joint and structural systems shall be manufacturer's standard tapes or special designed systems as required. Roof systems shall be fastened to supports as recommended by the roof system manufacturer.
- 2.2.5 Flashings shall be aluminum, 0.040 inch thick minimum.
- 2.3 Optional Face Sheet Material for metal-framed skylight panels shall be 1/8-inch thick clear acrylic panels assembled in accordance with manufacturer's recommendations. Panel assemblies shall be limited to 4-foot by 4-foot modules composed of 12 inches by 24 inches or 8 inches by 20 inches nominal grid size as required.
- 2.4 Panels may be 1-9/16 inch thickness where required.
- 3.0 EXECUTION:
  - 3.1 Installation of Skylights shall be coordinated with installation of roof deck or other substrates and with vapor barriers, roof insulation, roofing, and flashing as required to ensure that combined elements are waterproof and weather tight. Units shall be anchored securely to supporting structural substrates to withstand lateral and thermal stresses including inward and outward leading pressures.
  - 3.2 Isolation: Where metal surfaces of units are required to be installed in contact with noncompatible metal or corrosive substrates, including wood, apply bituminous coating on concealed metal surfaces, or provide other permanent separation.
  - 3.3 Flange Seals: Where required, set flanges of accessory units in a thick bed of roofing cement to form a seal.
  - 3.4 Cap Flashing: where cap flashing is required, install to provide adequate waterproofing overlap with roofing or roof flashing (as counter flashing). Seal with thick bead of mastic sealant, except where overlap is indicated to be left open for ventilation.
  - 3.5 Cleaning: Clean exposed metal and panel surfaces.
  - 3.6 Before the ceiling adjacent to the skylight is furred, or when directed by the Contracting Officer, the skylight shall be flooded with water, and should any leaks develop they shall be made tight by the Contractor.

END OF SECTION 07812



## 07000 - Thermal & Moisture Protection

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### SECTION 07830

#### ROOF ACCESS/SMOKE VENTS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of roof access and smoke vents. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation and surface preparation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
  - 2.1 ROOF SCUTTLES:
    - A. Galvanized steel, complete with padlock hasps inside (padlocks are not in contract), and factory primed ready for field painting as specified in Painting - Section 09900.
  - 2.2 SMOKE VENTS:
    - A. Double leaf smoke vent, galvanized steel, factory primed ready for field painting as specified in Painting - Section 09900, and no exterior release handle. Provide opening and closing mechanisms accessible from stage floor.
  - 2.3 FABRICATION
    - A. Fabricate with welded or sealed mechanical corner joints, and with cant strips and base profile coordinated with roof insulation thickness.
    - B. Sloping Roofs: Where slope of roof deck exceeds 1/4" per foot, fabricate curb/support units with height tapered to match slope, to result in level installation of tops of units.
  - 2.4 FINISHES
    - A. Factory primed, ready for field painting as specified in Section 09900 - Painting.
- 3.0 EXECUTION:
  - 3.1 Installation of Roof Access or Smoke Vents shall be coordinated with installation of roof deck or other substrates and with vapor barriers, roof insulation, roofing, and flashing as required to ensure that combined elements are waterproof and weather tight. Units shall be anchored securely to supporting structural substrates to withstand lateral and thermal stresses including inward and outward leading pressures.
  - 3.2 Isolation: Where metal surfaces of units are required to be installed in contact with noncompatible metal or corrosive substrates, including wood, apply bituminous coating on concealed metal surfaces, or provide other permanent separation.
  - 3.3 Flange Seals: Where required, set flanges of accessory units in a thick bed of roofing cement to form a seal.





## 07000 - Thermal & Moisture Protection

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- 3.4 Cap Flashing: where cap flashing is required, install to provide adequate waterproofing overlap with roofing or roof flashing (as counter flashing). Seal with thick bead of mastic sealant, except where overlap is indicated to be left open for ventilation.
- 3.5 Provide wood nailers at tops of curbs. Coordinate with thickness of insulation and roof flashing as indicated, and tapered where necessary to compensate for roof deck slopes of 1/4" per foot and less.
- 3.6 Connect sensing devices at scuttles and smoke vents to building security system.
- 3.7 Cleaning: Clean exposed metal and panel surfaces.

END OF SECTION 07830



## 07000 - Thermal & Moisture Protection

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### SECTION 07900

#### SEALANTS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of sealants. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation and surface preparation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
  - 2.1 Oil-Based Calking Compound Submit manufacturer's Data for review.
  - 2.2 Two-Component Polyurethane Sealant shall be an elastomeric type compound. The compound shall be supplied in pre-measured kit form for on-the-job mixing. Submit Manufacturer's Data for review.
  - 2.3 Butyl Rubber Sealant: Submit Manufacturer's Data for review.
  - 2.4 Single-Component Polysulfide Sealant shall be an elastomeric type compound. Submit Manufacturer's Data for review.
  - 2.5 Polyisobutylene-Based or Isoprene-Isobutylene-Based Pressure-Sensitive Tape or Bead: When applied between two clean, dry surfaces of specified thickness' and under conditions of continuous pressure that will be encountered in use, the sealant shall seal the joint from water and shall be weather-resistant. The material shall be nonbleeding at 160 F and below, shall withstand temperature ranges from minus 30 F to 200 F without loss of adhesion and without slipping, and shall have properties allowing the compound to move with the expansion and contraction of structure. The tape or bead shall be plain or contain a cloth or fiber insert. The tape or bead shall be supplied in rolls with a removable paper for cloth backing.
  - 2.6 Silicone Rubber Base Sealant shall be an elastomeric type compound conforming to TT-5-1543, Class A or B as required.
  - 2.7 Preformed Strip Sealants
    - 2.7.1 Preformed Butylene Strip Sealant shall be foamed-urethane strip saturated with a butylene waterproofing material.
    - 2.7.2 Preformed Asphalt Impregnated Strip shall be asphalt-impregnated foamed-polyurethane strip.
  - 2.8 Acoustical Sealant: Synthetic rubber or polymeric-based material shall conform to the following:
    - 2.8.1 Consistency: ASTM D 217, 190 to 310.
    - 2.8.2 Aging: Slightly tacky at 160 F after 50 days.
    - 2.8.3 Accelerated Aging: No significant change after 260 hours in weathermeter.
    - 2.8.4 Nonstaining.



## 07000 - Thermal & Moisture Protection

- 2.8.5 Solids Content: Approximately 80 to 90 percent.
- 2.8.6 No Oil Migration.
- 2.9 Silicone RTV Foam Firestop Sealant shall be a medium-density two-part product supplied as liquid components. When components are thoroughly mixed in a one-to-one ratio by either weight or volume the sealant shall expand and cure to a foamed elastomer at room temperature in 1 to 3 minutes.
- 2.10 Sealer: Sealer for use with oil-based calking compound shall be aluminum paint.
- 2.11 Primer: Primer for two-component polyurethane sealant, butyl rubber sealant, and single-component polysulfide sealant shall be as recommended by the sealant manufacturer. Primer shall have been tested for durability with the sealant to be used and on samples of the surfaces to be sealed.
- 2.12 Backstop Material: Backstop material shall be resilient urethane or polyvinyl-chloride foam, closed-cell polyethylene foam, closed-cell sponge of vinyl or rubber, polychloroprene tubes or beads, polyisobutylene extrusions, preformed neoprene, neoprene rod, oilless dry jute, or rope yard. Backstop material shall be nonabsorbent, nonstaining, and compatible with the sealant used. Tube or rod stock shall be rolled into the joint cavity. Preformed support strips for ceramic and quarry tile control joint and expansion joint work shall be polyisobutylene or polychloroprene rubber.
- 2.13 Bond-Preventive Materials shall be pressure-sensitive adhesive polyethylene tape, aluminum foil, or wax paper. Backstop material with bond-breaking characteristics may be installed in lieu of bond-preventive materials specified.
- 3.0 EXECUTION:
- 3.1 General Surface Preparation: The surfaces of joints to be sealed shall be dry. Oil, grease, dirt, chalk, particles of mortar, dust, loose rust, loose mill scale, and other foreign substances shall be removed from all joint surfaces to be sealed. Oil and grease shall be removed with solvent and surfaces shall be wiped with clean cloths.
- 3.2 Concrete and Masonry Surfaces: Where surfaces have been treated with curing compounds, oil, or other such materials, the materials shall be removed by sandblasting or wire brushing. Laitance, efflorescence, and loose mortar shall be removed from the joint cavity.
- 3.3 Steel Surfaces: Steel surfaces to be in contact with sealant shall be sandblasted or, if sandblasting would not be practical or would damage adjacent finish work, the metal shall be scraped and wire brushed to remove loose mill scale. Protective coatings on steel surfaces shall be removed by sandblasting or by a solvent that leaves no residue.
- 3.6 Aluminum Surfaces: Aluminum surfaces of windows and door frames in contact with sealants shall be cleaned of temporary protective coatings. When masking tape is used for a protective cover, the tape and any residual adhesive shall be removed just prior to applying the sealant. Solvents used to remove protective coatings shall be as recommended by the manufacturer of the aluminum work and shall be nonstaining.

END OF SECTION 07900

END OF SPECIFICATION SECTION 07 – Thermal & Moisture Protection



## 07000 - Thermal & Moisture Protection

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## SECTION 08110a

### HOLLOW METAL DOORS AND FRAMES

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of hollow metal doors and frames. Products be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
  - 2.1 Shop Drawings
    - 2.1.1 Prepare and submit detailed shop drawings of work included herein for approval, and do not proceed with any work for which such drawings are required until they have been approved.
    - 2.1.2 The drawings shall indicate the kinds of materials, sizes, gauges and shapes of members, the detail of pieces worked out with due reference to their position, method of securing same together, and the proper execution of the work in connection with other trades.
    - 2.1.3 Approval of shop drawings shall not relieve the Contractor from the responsibility for the correctness of details and dimensions, for the proper fabrication and installation of the work, nor from the obligation to provide all materials and labor required.
  - 2.2. Samples
    - 2.2.1 Submit three (3) samples of each metal of each gauge used in construction of its work to the Contracting Officer for approval.
    - 2.2.2 Each sample shall show each coat of treatment of primer as specified in Division 9, progressing from base metal to finished product.
  - 2.3 Label Requirements
    - 2.3.1 Where labeled openings (FBSC Doors) are required, the doors and frames shall be constructed and installed in accordance with requirements of Underwriters Laboratories, Inc., for the class of opening and fire rating required.
    - 2.3.2 The doors and frames shall bear the Underwriters' labels appropriate to each particular class of opening.
  - 2.4 Product Handling
    - 2.4.1 Protection
      - a. Deliver, store and handle all metal doors and frames in a manner to prevent damage and deterioration.



## 08000 - Doors & Windows

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- b. Provide packaging such as cardboard or other containers, separators, banding, spreaders, and paper wrappings as required to completely protect all metal doors and frames during transportation and storage.
- c. Store doors, upright, in a protected dry area, at least one inch off the ground and with at least 1/4 inch air space between individual pieces; protect all prefinished and hardware surfaces as required.
- d. Use all means necessary to protect the installed work and materials of all other trades.

### 2.4.2 Replacements

In the event of damage, immediately make all repairs and replacements necessary to the approval of the Contracting Officer.

### 2.5 Fabrication

- 2.5.1 All hollow metal work shall be fabricated accurately and assembled neatly so that the work will be smooth and free from dents, tool marks, visible waves, warp, buckles and conspicuous joints. Assemble work at the shop where practical. Remove all burrs, fins and sharp edges.
- 2.5.2 Lines shall be straight and true, arises and angles as sharp as practical, miters formed in true alignment, and similar abutting profiles accurately joined.
- 2.5.3 All joints shall be assembled so that intersections will be imperceptible when finished. Make all joints close fitting and also watertight where exposed to the weather.
- 2.5.4 Form each member, such as jamb and head, from a single piece of metal, unless otherwise approved.
- 2.5.5 Work showing defects or blemishes may be rejected, and all rejected work shall be replaced with satisfactory work.
- 2.5.6 All members shall be fastened together as to provide rigid construction in the assembled work. Weld all connections except those for removable members such as glazing beads.
- 2.5.7 Joints on exposed faces shall be continuously welded and dressed smooth and flush so as to be inconspicuous.
- 2.5.8 Provide sinkages, cutouts, and concealed reinforcement and do all drilling and tapping for the proper installation and attachment of all hardware. Templates will be provided under Section 08710.
- 2.5.9 Except where spot welds are specified make all exposed welds continuous for full length of joint.
- 2.5.10 Cut off exposed ends of bolts and screws and dress flush with nuts or surrounding surface such that all threads are concealed.
- 2.5.11 Castings shall be sound and free from surface or internal defects that mar appearance or will impair strength.

### 2.6 Materials

- 2.6.1 Sheet Steel: Cold-rolled, full pickled, annealed, patent or stretcher leveled, open hearth, furniture steel free from rust, scale, pits and other surface or internal defects. Where specified sheet steel shall be copper bearing.



## 08000 - Doors & Windows

- 2.6.2 Accessories: Anchors, clips, brackets, fasteners, etc. shall be some material as parent items except where otherwise specified.
- 2.6.3 Galvanizing (Zinc-Coating): Hot dipped as per ASTM A123. Not less than 2 ounce of pure virgin zinc per sq. ft. of surface area. Shall be capable of withstanding 10-1 minute immersions under Preece test as per ASTM A90. Shall be performed after fabrication wherever possible.
- 2.7 Metal doors
- 2.7.1 Unless otherwise shown, doors shall be of flush type, 1-3/4 inches thick. Use furniture steel for all exposed metal of doors. All doors shall be fitted with fire proof sound deadening insulation.
- 2.7.2 Bevel lock stiles of hinged doors at the rate of 1/8 inch in 2 inches. Reinforce doors with concealed plates or rolled shapes so to make them rigid and secure and as necessary to obtain satisfactory alignment. Fasten reinforcements with concealed bolts or rivets, or with approved spot welding. The top edges of exterior doors shall be enclosed flush.
- 2.7.3 Provide muntins and/or glazing beads for glazed doors and vision panels, rolled from furniture steel, mitered at corners, assembled into frames, and secured with countersunk oval headed screws. Arrange vision panels for double glazing with two thickness of glass. Removable members on room side.
- 2.7.4 Provide louvered panels (where required) in doors fabricated of furniture steel.
- 2.7.5 Provide tamper-proof screws for securing exterior moldings.
- 2.7.6 Spot weld astragal to inactive door on double doors without mullions.
- 2.7.7 Doors shall consist of a shell formed of 2 steel cover sheets (18 ga. for interior doors and 16 ga. for exterior doors) spot-welded to a 16 ga. steel channel frame around entire perimeter of door. Shell shall be internally reinforced with 16 ga. steel channel or "Z" bar vertical web stiffeners spaced not more than 6" o vertical stiffeners shall be continuous for full height of door except at openings for glass panels and louvers. Space between web stiffeners shall be packed solid with an inorganic fiber insulator. Edge joints of cover sheets shall be closed tight and continuously welded on in lieu thereof spot-welded not more than 3" o.c. and filled solid between welds with a metallic filler. All exposed welds shall be ground smooth and flush.
- 2.7.8 Hardware furnished under Section 08710.
- 2.7.9 Moldings and muntins for glass panels shall be 20 ga. steel members, removable on room side and secured in place with 6/32" countersunk exposed oval head screws. Rabbet for 1/4" glass shall be 3/8". Stair doors and cross-corridor doors shall be designed for double glazing.
- 2.8 Metal Frames
- 2.8.1 Frames shall be a combination type with integral trim.
- 2.8.2 Construct jambs and heads from one piece of metal each; rabbeted and flanged as required for the various types of openings, and neatly mitered or interlocked and welded together. Include all channel, angle and/or bent plate reinforcing indicated or otherwise required, as per approved shop drawings. Provide reinforcing in the heads of frames.
- 2.8.3 Provide frames for masonry opening with adjustable Underwriter's type masonry anchors or other approved type to suit conditions of installation, using not less than three (3) at each jamb.



## 08000 - Doors & Windows

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- 2.8.4 Provide frames with caulking stops, filler pieces and/or trim where or required; integrally formed as part of the frame wherever possible. Applied caulking stops, filler pieces, etc., shall be neatly attached by spot welding.
- 2.8.5 Equip sound-proof frames with adjustable door stops and continuous rubber seals, and filled solidly with sound deadening material.
- 2.8.6 At butts, cut back jamb the thickness of one leaf of butt.
- 2.8.7 Drill and tap reinforcement to template.
- 2.8.8 Spot weld #20 ga. plaster guard to frame at latch cutouts.
- 2.8.9 Install finish hardware (furnished under Section 08710)
- 2.9 Weatherstripping
  - 2.9.1 All exterior hollow metal doors shall be weatherstripped at heads and jambs with spring bronze weatherstripping similar and equal to Series 19WB manufactured by Zero Weather Stripping Co., Inc..
  - 2.9.2 Where weatherstripping type saddles are provided under another Section, furnish and install extruded aluminum angle type weatherstripping at bottom of door, similar and equal to Zero No. 24-Wg
  - 2.9.3 Where interlocking type saddles are not provided, exterior doors shall be fitted at the bottom with spring bronze weatherstrips similar and equal to Zero No. 37.
  - 2.9.4 All exterior doors shall be fitted at the bottom on the outer side with an extruded aluminum rain drip similar and equal to Zero No. 11-A.
- 2.10 Finish Hardware

Install all finish hardware in strict accordance with the manufacturer's recommendations, eliminating all hinge-bound conditions and making all items smoothly operating and firmly anchored into position. (Refer to Section 08710).
- 2.11 Painting
  - 2.11.1 Before leaving the shop, thoroughly clean all surfaces, wire brush them and wash with benzine.
  - 2.11.2 Give all surfaces one coat of zinc chromate or other approved rust-preventative primer; exposed surfaces one coat of filler, and one additional coat of paint.
  - 2.11.3 Each coat shall be separately applied, and surfaces sanded smooth between coats.
  - 2.11.4 Finish painting as specified under the Painting Section (Refer to Section 09900).
- 2.12 Baked Enamel Finishes:

Where required, provide manufacturer's standard baked enamel finish consisting of not less than one coat enamel primer and one coat enamel finish each coat separately oven baked at proper temperature to polymerize the finish. Before application of primer all depressions in surface shall be filled with a metallic filler baked-on and the entire surface sanded smooth and plane and thoroughly cleaned of all foreign matter. Surface shall also be sanded smooth between coats. Finish shall have eggshell texture.
- 3.0 EXECUTION





### 3.1 Surface Conditions

#### 3.1.1 Inspection

- a. Prior to installation of metal doors and frames, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.
- b. Verify that metal doors and frames may be installed in strict accordance with all pertinent codes and regulations, the original design, approved Shop Drawings, and manufacturer's recommendations.
- c. the Contracting Officer reserves the right to take apart one or more doors for the purpose of examining the materials and construction of same, subject to the conditions stated.

### 3.2 Installation

#### 3.2.1 Metal Doors and Frames

- a. Install all metal doors and frames in strict accordance with all pertinent codes and regulations, the approved Shop Drawings, and the manufacturer's recommendations, anchoring all components firmly in position for long life under hard use.
- b. Set frames accurately, plumb and true.
- c. Adjust any irregular or defective frame work.
- d. Carry jambs down to rough floor slab and securely anchor in place.
- e. Coordinate with work of other trades.

END OF SECTION 08110a



## 08000 - Doors & Windows

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### SECTION 08110b

#### STAINLESS STEEL DOORS AND FRAMES

1.01 DESCRIPTION: This specification covers the furnishing and installation of stainless steel doors and frames. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

1.02 REFERENCED DOCUMENTS:

A. Industry Standards

1. American Society for Testing and Materials (ASTM)  
A167 Standard Specification for Stainless Chromium Wicker Steel Plate Sheet and strip
2. Steel Door Institute (SDI)  
105 Erection Instructions for Steel Frames  
107 Hardware on Steel Doors
3. Underwriters Laboratories, Inc. (UL)
4. National Association of Architectural Metal Manufacturers (NAAMM): Hollow Metal Manual

2.0 PRODUCTS

FRAMES

A. Material: Cold-rolled, stretcher-leveled Type 304 stainless steel sheets having clean, smooth, number four finish surface.

1. Exterior frames: Not lighter than ( ) gauge.
2. Interior frames: Not lighter than ( ) gauge.

B. Accessories

1. Loose beads: ( ) gauge Type 304 stainless steel having number four finish surface.
  - a. In public area: Interlocking grip type having concealed fasteners.
  - b. In nonpublic area: Secured with fasteners.
2. Gaskets: Either neoprene or felt.
3. Door strikes: Box type, with mortar guards.
4. Hardware reinforcing plate: Type 304 stainless steel; 16 gauge, except plate for hinges shall be 1/8 inch thick.
5. Fasteners
  - a. For anchoring frame to floor: Either expansion bolt or powder fasteners.



- b. For securing beads: Phillips head stainless steel machine screw; finish of screw head shall match beads.
  - 6. Floor anchors: Adjustable.
    - a. For interior frames: Not lighter than ( ) gauge.
    - b. For exterior frames: Not lighter than ( ) gauge.
- C. Design: Have integral trim and stops.
  - 1. If fastened to studs: Have integrally-formed fasteners.
  - 2. If placed in plaster and wallboard partition: Have studs and plaster keys.
  - 3. If set in solid plaster partition: Have clips or anchors welded to frame back adjacent to lath.
  - 4. If set in masonry or concrete: Have adjustable anchors capable of projecting not less than 10 inches into wall.

### 2.02 DOORS

- A. Facings: Cold-rolled, stretcher-leveled Type 304 stainless steel sheets having clean, smooth, number four finish surface.
  - 1. For full flush door: Not lighter than ( ) gauge.
  - 2. For stile-and-rail and stile-and panel doors: Not lighter than ( ) gauge.
  - 3. For recessed panel door: Not lighter than ( ) gauge and spaced 3/8 inch apart.
- B. Space filler: Fiberboard, or mineral wool.
- C. Stiffeners: Not lighter than 16 gauge Type 304 stainless steel.
- D. Top and bottom edges of full flush and stile-and-panel doors: Continuous Type 304 stainless steel channel having clean, smooth, number four finish surface.
- E. Rail and stile of stile-and-rail and recessed-panel doors: Not lighter than ( ) gauge, 1-5/8 inches thick Type 304 stainless steel having number four finish surface, 5-1/2 inches wide except that bottom rail eight inches wide.
- F. Stile for stile-and-panel door: Not lighter than ( ) gauge, Type 304 stainless steel having number four finish surface, 5-1/2 inches wide.
- G. Facing separator for recessed-panel door: Resilient.
- H. Appurtenances
  - 1. Astragal: Rolled Type 304 stainless steel having clean, smooth, number four finish surface.
  - 2. Glazing beads: Not lighter than ( ) gauge Type 304 stainless steel having a number four finish surface.
    - a. In public areas: Interlocking grip type having concealed fasteners.
    - b. In nonpublic area: Secured with fasteners.



## 08000 - Doors & Windows

3. Fasteners for securing beads: Phillips head stainless steel machine screw; finish of screw head shall match beads.
4. Hardware reinforcing plates: Type 304 stainless steel; 16 gauge, except plate for hinges shall be 1/8 inch thick.

2.03 DOOR LOUVERS: One inch thick, stationary, Type 304 stainless steel having number four finish surface.

A. Material

1. Blades: Type 304 stainless steel having number four finish surface.
  - a. For interior doors: Not lighter than ( ) gauge.
  - b. For exterior doors: Not lighter than ( ) gauge.
2. Screen: 26 gauge, 18 by 20 mesh, Type 304 stainless steel.

B. Style

1. For interior doors: Inverted "V" blade having not less than 80 percent free air area.
2. For exterior doors: Weatherproof "Z" blade having not less than 60 percent free air area.

2.04 FABRICATION: Measure openings before fabricating doors and frames.

A. Doors: Fabricate to clear jambs, head, and meeting stile by not more than 1/8 inch, and to clear walking surfaces by not more than 3/8 inch. Smooth exposed welds and flush with adjacent surfaces. Fabricated door shall be rigid, straight, true, and free from defects. Continuously seal weld top and bottom edge seams; round edges to 1/16 inch radius and finish to match adjacent surfaces. Round lock edge of double door stiles, and bevel lock edge of single door stile 1/8 inch in two inches. Rabbet light openings, miter glazing beads at corners, and recess beads from facing sheets; countersink fasteners. Mortise, reinforce, drill, and tap doors for hardware at door factory. Install reinforcing plates for surface-applied hardware and concealed overhead closers, except install no plates for plate type hardware; conceal reinforcing plates from view. Weld astragal to outside face of exterior double door and to fire-rated double door active leaf lock edge stile. Conceal closer in top edge and automatic drop bottom seal in bottom edge.

1. Full flush
  - a. Space stiffeners vertically and on not more than six-inch centers. Spot-weld stiffeners to inner surface of each facing.
  - b. Continuously weld channel to inner surface of each facing.
  - c. Apply space filler between stiffeners.
  - d. Weld edges and finish flush with adjacent surfaces.
2. Recessed-panel: Place a layer of facing separator between facings.
3. Stile-and-panel
  - a. Interlock or weld panel to stiles.
  - b. Space stiffeners vertically and on not more than six-inch centers. Spot-weld stiffeners to inner surface of each facing.



- c. Apply space filler between stiffeners.
    - 4. Stile-and-rail
      - a. Interlock or weld panel to stile and rails.
      - b. Space stiffeners vertically and on not more than six-inch centers. Spot-weld stiffeners to inner surface of each facing.
      - c. Apply space filler between stiffeners.
  - B. Louvers: Attach screen to inner face of door, and affix trim to louver perimeter.
  - C. Frames: Rigid, straight, true, and free from defects.
    - 1. Form stops. Except if stops will have sealing gaskets, terminate stops ( ) inches above finish floor, chamfer and close stop bottom.
    - 2. Miter or butt corner joints, and continuously weld full depth and width of section. Conceal frame fasteners.
    - 3. Weld joints, grind weldments smooth, and make joints flush with adjacent surfaces.
    - 4. Drill and tap holes for glazing beads and gaskets.
    - 5. Form beads. Miter loose beads or butt-weld at frame corners. Secure beads to frames not in public areas, with fasteners on not more than nine-inch centers; countersink fasteners.
    - 6. Punch holes for door silencers.
    - 7. Fasten temporary steel spreaders across frame bottom.
    - 8. Mortise, reinforce, drill, and tap frames for hardware at factory. Install reinforcing plates for concealed overhead closers and surface-applied hardware, except install no plates for plate type hardware; conceal reinforcing plates from view. Install strikes with clearance for door silencers.
  - D. Fire-rated assemblies, including those larger than allowed by UL for label service: Construct in accordance with UL requirements. Apply UL label on hinge edge of door and frame.
- 2.05 SEALANTS: SEALANTS.
- 3.0 EXECUTION
- 3.01 EXAMINATION: Examine surfaces and openings to receive stainless steel doors and frames for defects before installing doors and frames; correct defects.
- 3.02 FRAMES: Plumb, align, and anchor. Terminate frame bottom at finished floor level and anchor to structural floor. If level differs from finished floor level, extend frame bottom with floor anchors. Anchor head with not fewer than two anchors, and anchor each jamb on not more than 24-inch centers. If construction permits concealing frame spreaders, spreaders may be left in-place; otherwise remove spreaders after frames have been anchored. Secure door frame anchors to adjacent construction. Fully grout secure room door frame in-place. Seal joint between frame and adjacent finish as specified in SEALANTS.



## 08000 - Doors & Windows

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3.03 DOORS: Hang door to ensure smooth and easy operation, and which will eliminate binds, warps, and squeaks.

END OF SECTION 08110b



## SECTION 08120

### ALUMINUM DOORS AND FRAMES

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of hinged aluminum doors and frames. Products shall be as directed, by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.1 Protection of Surface: All finished aluminum work before shipment to the job shall be given a coating which will provide a suitable protection for the finish during the shipping and erecting periods. This coating shall not be removed until such time as the Contracting Officer may direct.
- 1.2 Shop Drawings:
  - 1.2.1 Detailed shop drawings of the frames and other work shall be submitted for approval prior to the fabrication of any of this work in the shop.
  - 1.2.2 All exterior profiles shall be strictly maintained with surfaces straight and true to form.
- 2.0 PRODUCTS:
  - 2.1 Doors:
    - 2.1.1 Aluminum doors shall be constructed of extruded aluminum shapes, tubes and sheets, properly reinforced.
    - 2.1.2 Aluminum and steel reinforcements shall be of no less than 1/8" thickness.
    - 2.1.3 Provide all cut-outs, sinkages, and reinforcement for the proper installation of finish hardware specified in Section 08710 for the installation of glass specified in Section 08810.
    - 2.1.4 Doors shall be accurately constructed with continuous welding, invisible joints, and with fully concealed bolts where used.
    - 2.1.5 Doors shall be reinforced in a manner to avoid possibility of waves or other distortions of the surfaces. Voids inside doors shall be filled with sound deadening material as approved by the Contracting Officer.
    - 2.1.6 All exterior doors shall be of weatherproof construction.
    - 2.1.7 Provide all molding for glass, accurately mitered at corners and secured with countersunk oval head stainless steel screws, uniformly spaced as approved.
    - 2.1.8 All aluminum doors, both exterior and interior, shall be equipped on both sides with 1/8-inch thick aluminum kick plates eight inches high (minimum) and full width of doors.
    - 2.1.9 For remaining hardware, see Section 08710.
  - 2.2 Frames:



## 08000 - Doors & Windows

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### 2.2.1 Cast Aluminum:

- A. If cast aluminum is used for the exterior door frames, the castings shall have a minimum thickness of 1/4" at any point and shall be increased at butt recesses and lock strike for structural strength.
- B. Webs shall be provided as required for structural stiffening. Additional steel reinforcement shall be located as required to receive hardware.

### 2.2.2 Extruded Aluminum:

- A. If extruded aluminum frames are used for exterior doors, they shall be 1/8-inch minimum thickness and shall be reinforced with rolled or bent steel members not less than 1/8-inch thick extending the full length of jambs, mullion, heads and transoms, or 1/4-inch thick extrusions with steel block reinforcement at hardware locations; reinforcement shall fit snugly.
- B. Jambs shall be provided with 1/8-inch by 2-inch steel strap anchors spaced two-feet on centers, secured to steel reinforcing and built into or expansion bolted to masonry.

### 2.2.3 Dissimilar Metals:

- A. All surfaces between ferrous and non-ferrous metals or in contact with masonry shall be coated with approved asphaltum paint before assembly or erection.
- B. All bolts, nuts, tap screws, etc., used in assembling that are in contact with aluminum or bronze shall be of stainless steel (for aluminum) and bronze for work in contact with bronze.
- C. Stainless steel items shall be as specified in Division 5.
- D. Provide tamper-proof screws for securing exterior moldings at all exterior door frames, transoms, sidelights, panels, etc.

### 2.3.0 MATERIAL

2.3.1 Aluminum alloy 43 or 214 shall be used for castings, and aluminum alloy 6063 shall be used for extruded work.

2.4.1 Standard: All aluminum work of doors, door frames, transoms and panels in connection with same shall be given an aluminum coating equal to aluminite 204-CI, for extrusions and 704 for castings as specified by the Aluminum Co. of America.

2.4.2 Duranodic: When a "Duranodic" finish is indicated on drawing it shall comply with standards and procedures developed by Aluminum Company of America.

### 3.0 EXECUTION:

#### 3.1 Erection:

- 3.1.1 Set frames accurately, plumb and true.
- 3.1.2 Carry jambs down to rough floor slab and securely anchor in place.
- 3.1.3 Coordinate installation with other trades.

3.2 Adjusting: Adjust any irregular or defective work, to the satisfaction of the Contracting Officer.





END OF SECTION 08120



## 08000 - Doors & Windows

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### SECTION 08210

#### WOOD DOORS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of wood doors. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.1 MANUFACTURER
- A. Weyerhaeuser Co., Tacoma. Washington
  - B. U.S. Plywood, New York, NY
  - C. Or approved equal
- 1.2 LABEL REQUIREMENTS
- A. Where labeled openings are required, the door shall be constructed and installed in accordance with requirements of Underwriters Laboratories, Inc., for the class of openings and fire rating required.
  - B. The doors shall bear the Underwriter's labels appropriate to each particular class of openings.
- 1.3 SAMPLES
- A. Submit cut-away Section showing construction, including glazed panel molding and methods of securing.
  - B. Finish to show, raw wood, stain, sealer and two coats of varnish color to be as selected by the Contracting Officer , from manufacturers' standard colors.
  - C. Size of sample approximately 12" x 16"
  - D. Do not proceed with fabrication until sample is approved.
- 1.4 INSPECTION
- A. the Contracting Officer reserves the right to take apart one or more doors for inspection purposes. Failure of doors to conform to all specification requirements shall be just cause for rejection of all doors of similar type furnished.
  - B. All rejected doors shall be replaced with new doors meeting all specification requirements and at no cost to the owner.
- 1.5 CERTIFICATE: GUARANTEE
- A. Obtain and submit to the Contracting Officer a notarized certificate and guarantee from the door manufacturer, stating that these doors have been constructed, finished etc. in strict accordance



with the requirements of this specification and that these doors are free from any defects which shall make them unsuitable for the use for which they were intended.

- B. Guarantee shall be for a period of 5-years from date of installation. Guarantee shall also provide for replacement, rehanging and refinishing of all doors, that in the opinion of the Contracting Officer fail during this period; all the aforesaid to be done at no cost to the owner. This guarantee supersedes requirements as noted in Contract Form.
- C. Door manufacturer shall inspect doors after installation and state in the guarantee that no provisions of the guarantee have been voided or nullified and that the guarantee is in full effect at completion of installation.

### 1.6 PACKAGING PROTECTION: STORING

- A. Door manufacturer shall package doors in heavy kraft paper cartons prior to shipment.
- B. All cartons must have door sizes stamped on same.
- C. Doors shall not be removed from cartons until ready to hang.
- D. No doors shall be delivered to job, until job has been completely enclosed, or when directed by the Contracting Officer.
- E. When delivered, doors shall be stored in dry, well ventilated area.
- F. Do not hang doors until all Plastering, Painting and Finish Flooring have been completed in the areas which are to receive doors.

### 2.0 PRODUCTS:

#### 2.1 CONSTRUCTION

- A. Flush type 1-3/4 inch thick.
- B. Doors shall be Type 1, Class A, solid wood core (stave core), conforming to Fed. Spec. LLL-D-581 (b) or, C.S. 171, Hardwood Veneered Doors (solid Core) and as modified hereinafter.
- C. All doors must be marked on top edge with stamp showing type, class and manufacturer.
- D. All double acting doors shall have edges rounded.
- E. Warpage tolerance shall not exceed 1/4" in 8-feet.
- F. CORE:
  - 1. Core constructed of kiln-dried low density wood blocks or staves.
  - 2. Face width of staves or blocks not to exceed thickness of door.
  - 3. Core shall contain only one specie of wood throughout, assembled and glued with grain running vertically, butt joints well staggered in relation to adjacent block or staves.
- G. BANDING (EDGE STRIPS)
  - 1. Band cores four (4) sides with hardwood as hereinafter specified.
  - 2. stiles 3/4 inch thick vertical edge strips, full length without joints, exposed face to match face veneer.



## 08000 - Doors & Windows

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3. Top and bottom rails, minimum width 1-inch, solid or ply.

### H. CROSS BANDING

Sound grade birch or maple, 1/16-inch thick, no voids, spliced without use of tape. Laminate at right angles to core. Extend fully to all edges of door.

### I. FACE VENEER

1. Plain cherry birch, premium grade as per CS-35, book matched laminated with grain at right angles to cross banding. No half round red oak allowed.
2. Thickness 1/28-inch minimum
3. Veneer shall be selected for color as per samples.
4. Finish veneered doors shall be machine sanded on all edges and all surfaces.

### J. ADHESIVES

All adhesives used for door assembly shall be Type - II hot plate press phenolic type.

### K. OPENING IN DOORS

1. Provide cut out in doors for glazing and louvers. Seal all edges with 2 coats of varnish. Metal louvers furnished and installed under Section 8A.
2. STICKING
  - a. Muntin members and glazing beads cherry birch, mitered corners. Glazing beads (corridor side) glued in place and secured with brads.
  - b. Removable beads (room side) secured in place with oval head screws, with Phillip's slot set in metal cups.

## 2.2 FINISH

All interior wood doors shall be factory finished on faces and stiles as follows:

- A. One (1) coat of stain
- B. One (1) coat of sealer
- C. Two (2) top coats of conversion varnish.
- D. Top and bottom edges of doors and surfaces of hardware cutouts shall be thoroughly sealed against moisture penetration.

## 2.3 SOUND RETARDING DOORS

- A. Doors shall comply with all applicable requirements for solid core flush interior doors and in addition shall comply with requirements as hereinafter specified.
  1. Doors - 1 3/4-inch, minimum thickness
  2. Sound reduction rating, 38 to 42 decibels as per ASTM-E90
  3. Contractor shall submit test report to architect certifying that the sound proof door he proposes to install, will provide rating range as noted above.



### B. STOP BEADS

1. Adjustable type, matching hardwood (same specie as finish veneer) face with soft neoprene gasket.
2. Secure beads to metal jambs with metal cup bead adjusters and self-tapping sheet metal screws spaced 8" o (max.)

### C. THRESHOLD SEAL

Plunger operated, self-retracting neoprene gasket sweep. Mechanism may be let into face with a metal cover plate, or be completely housed in bottom of door.

### D. PROVIDE CUTOUT FOR GLAZING

Glazing furnished and installed under Glazing Section 08810.

### E. HARDWARE

1. Stop bead adjusters and threshold seal, furnished and installed under this Section of Work.
2. Hardware finish U.S. 26D or U.S. 32D.
3. Hardware furnished and installed under section 08710.

## 2.4 PRE-MACHINING

- A. Carefully mortise, drill or machine as required at the door manufacturer's factory for finish hardware as listed in Hardware Schedule.
- B. Obtain hardware manufacturer's template for use during machining.
- C. Verify hardware locations and hand of door prior to machining.
- D. All cutouts, etc., shall be protected with two (2) coats of varnish.
- E. the factory shall assume the responsibility of properly coordinating the approved hardware schedule door schedule and hollow metal buck shop drawings.

## 3.0 EXECUTION

### 3.1 FITTING AND HANGING

- A. Doors trimmed square at mill, 1/8" clearance at top and sides, 1/4" at bottom.
- B. Install doors when directed by Architect. All doors installed in metal bucks. Fit doors properly in opening.
- C. Doors beveled 1/8 inch in 2-inches.
- D. All raw wood areas resulting from fitting operations shall be immediately filled and sealed with two (2) coats of varnish. also applies to lite openings, louver openings, edges, top and bottom of doors.

### 3.2 HARDWARE INSTALLATION

- A. Install all door hardware; fit and adjust for proper working.



## 08000 - Doors & Windows

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- B. Secure each item of hardware with fastenings specified for that purpose.
- C. Hardware furnished and installed under Section 08710.

END OF SECTION 08210



## SECTION 08311

### ALUMINUM AND WOOD SLIDING GLASS DOORS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of sliding glass doors. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
  - 2.1 Aluminum Sliding Glass Doors shall be complete units with safety glass, weatherstripping, hardware, and integral tracks and rollers for smooth operation and installation. Sliding glass door panels shall conform to AAMA 402.8 or to ANSI A134.2. Classification of sliding glass doors shall be AAMA type SGD-A3 (monumental grade) provided for high performance (AP) designation.
  - 2.2 Wood Sliding Glass Doors shall consist of wood frame sliding and fixed safety glass panels and casings of selected West Coast hardwood treated with water repellent and factory-primed for exposed wood exterior frame parts and door panels. Sill facing shall be extruded anodized aluminum with PVC thermal barrier. Operating door track shall have stainless steel cap. Each unit shall include door panels, head and sill, track rollers (ball-bearing sheaves), weatherstripping, glazing channels, hardware, and accessories.
  - 2.3 Hardware shall include door pulls and keyless locking with interior locking lever on operating door panel.
  - 2.4 Glazing in door panels shall be safety glass in compliance with ANSI. Z97.1.
  - 2.5 Screen Doors shall be manufacturer's standard furnish with sliding door. Insect screen shall be 18 x 16 mesh aluminum wire conforming to Fed. Spec. RR-W-365 or glass fiber screen conforming to Fed. spec. L-5-125.
- 3.0 EXECUTION: Installation of door units shall be complete with all necessary anchors, inserts, and hardware.

END OF SECTION 08311



## SECTION 08312

### SLIDING FIRE DOORS - GENERAL

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of sliding fire doors. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
  - 2.1 Composite Sliding Fire Doors shall be standard steel face sheets bonded to and supported by rigid, dimensionally stable inorganic core, with steel reinforced edges. Finish shall be factory-primed.
  - 2.2 Hollow Metal (Sheet Metal) Sliding Fire Doors shall be standard flush design with not less than 20-gauge steel faces over steel stiffeners or honeycomb core materials. Finish shall be factory-primed.
  - 2.3 Tin-Clad Sliding Fire Doors shall be standard design wooden core construction with 14-inch by 20-inch maximum size, 30-gauge galvanized steel sheets not over 48 inches wide with venting as required by NFPA No. 80. Finish shall be galvanized.
  - 2.4 Horizontal Sliding Steel Doors shall be standard design consisting of two thickness' of 24-gauge, galvanized corrugated sheet steel with an asbestos core and framed with galvanized structural steel shapes. Sheets shall be applied with exposed face corrugations vertical and wall side corrugations horizontal. Finish shall be galvanized.
  - 2.5 Vertical Lift Sliding Steel Doors shall be standard design consisting of two thickness of 24-gauge galvanized corrugated sheet steel with an asbestos core and formed with galvanized structural steel shapes. Sheets shall be applied with exposed face corrugations vertical and wall side corrugations horizontal. Door shall be uprising on vertical tracks. Finish shall be galvanized.
  - 2.6 Metal-Clad (Kalamein) Doors shall be standard horizontal sliding metal covered wood core or stiles and rails and insulated flush panels covered with steel. Finish shall be factory-primed.
  - 2.7 Fire Door Assemblies shall be provided as complete units produced by one manufacturer.
    - 2.7.1 Fire Doors, Frames, and Fire Door Hardware shall be types that have been fire-tested and rated in accordance with ASTM E152. Doors shall bear labels of the Underwriters' Laboratories, Incorporated or Factory Mutual Laboratories as evidence of rating.
    - 2.7.2 Components for rated door assembly shall be listed in UL Building Materials Directory or Factory Mutual Approval Guide.
  - 2.8 Finish: Galvanized finish shall be hot-dip galvanized minimum 0.5 foot and shall not be factory-primed.
  - 2.9 Fire Door Hardware: Hardware shall be labeled, automatic closing type sliding fire door assemblies complete with adjustable roller guide, binders, floor stops, cables, sheaves, counterweight, and fusible links. Fusible links shall be UL listed, 165° F for ordinary temperature classification.





## 08000 - Doors & Windows

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- 2.10 Accessories: The following items shall conform to the requirements of NFPA No. 80: Astragal, chafing strips, bumper shoes, rear binder, stay rolls, wedge, and automatic closer.
- 3.0 EXECUTION:
- 3.1 Installation: Fire doors shall be installed in accordance with NFPA No. 80.
- 3.2 Temporary Fire Protection: During the execution of this work, temporary fire barriers, alarms, or watchmen shall be provided to the degree of opening protection required by the local authority until the permanent work is completed and operational.

END OF SECTION 08312



## 08000 - Doors & Windows

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### SECTION 08330

#### COILING (ROLLING) DOORS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of coiling doors, coiling grilles, and coiling counter shutters. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.1 Shop Drawing: All measurements shall be taken at the building. Submit complete shop drawings for approval by the Contracting Officer before fabrication of the doors, grilles and shutters.
- 1.2 Guarantee: Doors, grilles and shutters shall be guaranteed against all defects in material and workmanship for a period of one year from the date of acceptance of final payment.
- 1.3 Manufacturer
- A. Coiling Doors and Grilles
    1. North American Door Co., Inc.
    2. Kinnear Corp.
    3. Cornell Iron Works
    4. J. G. Wilson Corp.
    5. The Crawford Door Co.
    6. Walter Balfour & Co., Inc.
    7. R.C. Mahon, Co.
    8. Or, approved equal
  - B. Coiling Shutter
    1. Peele Company, 47 Stewart Avenue, Brooklyn, N.Y.
    2. The Stainless & Aluminum Specialty Co., 10 Amity Street, Jersey City, N.J.
    3. Or, approved equal.
- 2.0 PRODUCTS:
- 2.1 Coiling Steel Doors: Doors shall be the manufacturer's standard type. Doors shall be spring counterbalanced, overhead coiling type. Door shall be complete with all guides, tracks, hardware, fastenings, operating mechanisms, and accessories. Guides at jambs shall be set back a sufficient distance to provide a clear opening when doors are in the open position.
- 2.1.1 Roller Shaft: The roller shaft shall be constructed of steel pipe or commercial welded steel tubing of proper diameter and thickness for the size of the curtain. Deflection shall not exceed 0.03 inch per foot of span. Ends of roller shall be closed with cast-iron plugs, machined to fit the pipe. An oil-tempered, helical, counter-balancing steel spring, capable of producing sufficient torque to ensure easy operation of the door curtain from any position, shall be installed within the roller. Spring shall be easily adjustable.



## 08000 - Doors & Windows

- 2.1.2 Brackets: Brackets shall be fabricated of heavy cast iron or steel, designed to close the ends of roller-shaft housing and to form a supporting ring for hood. The bracket hubs or shaft plugs shall be equipped with prelubricated ball bearings, shielded or sealed.
- 2.1.3 Hoods: Each hood shall be constructed of steel not lighter than No. 24-gauge, formed to fit the contour of end bracket gear assembly and reinforced with steel rods or rolled beads at top and bottom edges. A weather baffle shall be provided at the lintel.
- 2.1.4 Gears: Gears shall be of the best grade gray iron, cast iron teeth machine-molded from machine-cut patterns, enclosed and protected by the hood and brackets.
- 2.1.5 Guides: The guides shall consist of steel shapes not less than 2-1/2 inches deep and not less than 3/16-inches thick and shall form a channel pocket of sufficient depth to retain the curtain in place under the wind pressure specified. Provisions for removal of the door shall be included in the design.
- 2.1.6 Head Track: Head track for side coiling grilles shall be of extruded aluminum and shall be provided with adjustable hangers spaced not more than 2 feet-6 inches on center.
- 2.1.7 Floor Track: Floor track for side coiling grilles shall be of extruded aluminum with replaceable bronze strips, flush with finish floor and shall provide a floor slot with a maximum width of 1/4 inch.
- 2.1.8 Bottom Rail: The curtain shall have a rolled-steel bottom bar consisting of two angles of equal weight, one on each side, fastened to the bottom of the curtain.
- 2.1.9 Endlocks and Windlocks: The ends of each slat shall have malleable iron endlocks of the manufacturer's standard design. The door shall have windlocks at the ends of each slat. Windlocks shall prevent curtain from leaving the guide as a result of deflection from wind pressure or other forces.
- 2.1.10 Weatherstripping: Doors exposed to weather shall have manufacturer's standard weatherstripping on jambs, top, and sill for wethertight installation.
- 2.1.11 Curtains: Curtains shall be formed of insulated interlocking galvanized steel slats of No. 20-gauge minimum thickness or of flat steel interlocking slats. The curtains shall be designed to resist designated wind pressure without damage. The curtains shall roll up on a drum supported at the head of the opening on brackets and be balanced by helical springs.
- 2.1.12 Counter Doors (Roll-Up Shutters): Integral counter shutter/frame shall be manufacturer's standard. Curtains shall be aluminum, minimum 22-gauge galvanized steel, or stainless steel, minimum 22-gauge Type 302 No. 4 finish as designated. Frame shall be fully welded into a single assembly, complete with anchors; the jambs and head shall be minimum 16-gauge stainless steel or plain steel, and the sill shall be formed of 14-gauge stainless steel No. 4 finish.
- 2.1.13 Fire Doors: Doors, frames, hardware, and other accessories shall be in accordance with NFPA 80.
- 2.1.14 Operation:
  - 2.1.14.1 Push-Up Operation: Doors shall have one lifting handle on each side of the door and shall be counter balanced to provide ease of operation while raising or lowering the curtain by hand.. The maximum exertion or pull required shall not exceed 25 pounds. Doors over 7 feet high shall be provided with pull down straps or pole hooks.



## 08000 - Doors & Windows

- 2.1.14.2 Chain-Gear Operation: Chain shall be galvanized, endless type, operating over a sprocket and shall extend to within 3 feet of floor. Gears shall be high grade gray iron, cast from machine-cut patterns. Gear reduction shall be calculated to reduce chain pull required to not exceed 35 pounds.
- 2.1.14.3 Crank-Gear Operation: Crank shall be removable and located approximately 34 inches above the floor. Gears shall be of high grade gray iron, cast from machine-cut patterns. Gear reduction shall be calculated to reduce pressure exerted on crank to be over 35 pounds.
- 2.1.14.4 Motorized Operation: Electric power-operated doors shall be complete with electric motors, operators, controls, switches, and safety devices. Control equipment shall comply with NEMA ICS-76.
- 2.1.15 Finish:
  - 2.1.15.1 Galvanizing: Curtain and bottom rail shall be hot-dipped galvanized with a zinc coating not less than 1.25 ounces total per square foot of flat metal, coating class 1.25 in accordance with ASTM A 525. Hood shall have either class 1.25 galvanizing as described above or be fabricated from electrolytic zinc-coated sheets conforming to ASTM A 591. Hardware items shall be galvanized according to ASTM A 153. Items galvanized after assembly shall comply with ASTM A 386.
  - 2.1.15.2 Pretreatment: All zinc-coated surfaces shall be given a phosphate coating prior to application of prime paint.
  - 2.1.15.3 Shop-Applied Prime Paint: All ferrous surfaces, including galvanized curtain, hood, and slats, but excluding wearing surfaces, shall be given one shop-applied prime coat of the manufacturer's standard primer in accordance with Fed. Spec. TT-P-86G. Primer shall be compatible with the specified finish paint and shall not contain lead. Non-galvanized surfaces shall be wire brushed to bare metal prior to primer application.
- 2.2 Coiling Steel Grilles
  - A. Galvanized roll-up steel grilles across corridors.
  - B. Manually operated push-up type rolling into a steel pocket concealed in the ceiling above.
  - C. Grilles shall slide in bronze guides and have an approved locking device.
  - D. Arrangements shall be made in ceiling pocket for access to mechanism for adjustments.
  - E. All parts shall receive a shop coat of rust inhibitive paint before installation.
- 2.2 Roll-up Aluminum Shutters
  - A. Units shall be completely factory assembled units consisting of rolling shutter and frame.
  - B. Extruded aluminum slats with end locks to maintain proper alignment.
  - C. Aluminum sliding lock bolt at either end with lift handle.
  - D. Stainless steel frame to suit wall thickness consisting of 16-gauge jambs, head and 14-gauge sill. (No. 4 finish ground and polished).
  - E. Aluminum shall be satin finish followed by anodizing.
  - F. Internal torsion springs for counter balance.
  - G. Stainless steel hood and fascia 16-gauge.



3.0 EXECUTION

3.1 Preparation

- A. Verify field dimensions prior to fabrication.
- B. Check work of other trades for conduits, ducts, pining etc. for clearance.

3.2 Installation

- A. Supporting angles should be properly fastened to building construction.
- B. Alignment shall be level and plumb.
- C. Guides shall be securely attached to adjoining construction. Doors shall be installed with all anchors and inserts for brackets, tracks, hardware, and other accessories located accurately. Upon completion, door shall be weathertight and shall be lubricated and adjusted to operate freely.

END OF SECTION 08330



## SECTION 08350

### FOLDING DOORS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation, of folding doors. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Door shall be full pantograph or "x-accordion" type with flexible fabric panels. Materials shall have a flame spread rating of 25 or less, fuel contributed rating of 10 or less, and a smoke developed rating of 5 or less, in compliance with ASTM E84. Each new door unit shall be a complete unit produced by one manufacturer including hardware, accessories, mounting, and installation components.
- 2.2 Framework for Door including posts, pantographs, hinges and hinge plates, and support rods shall be ferrous metal. All enclosed metal shall be galvanized ASTM A164, or cadmium-plated ASTM A 165. Posts and exposed metal items shall have phosphate treatment complying with Fed. Spec. TT-C-490.
- 2.3 Folding Mechanism:
- 2.3.1 Flexible Panels shall be fabricated with not less than 16-gauge metal. Provide one row at top for door up to 12 feet high, two rows at top for door over 12 feet high, single row at bottom, and intermediate rows not over 4 feet center to center. Provide vertical rods of a minimum 3/16-inch diameter for connecting hinges in non-rigid type panels.
- 2.3.2 Rigid panels shall be fabricated with not less than 14-gauge metal, pantograph top and bottom.
- 2.4 Lead Posts and Jamb Posts shall be fabricated of not less than 16-gauge steel ASTM A525 for door up to 10 feet high and not less than 14-gauge for door over 10 feet high.
- 2.5 Carriers: Carriers shall be nylon, ball-bearing, wheeled type.
- 2.6 Door Covering: Covering shall be attached to frame in a manner that will permit onsite removal and repair. Covering shall be treated to be flame-resistant and shall not peel, craze, crack, or fade. Fabric covering shall be vinyl-coated fabric complying with Fed. Spec. CC-W-408, 30 ounces per linear yard, 54 inches wide.
- 2.7 Acoustical-Rated Door shall be manufacturer's standard construction complying with ASTM E90 to provide a STC rating of 40. Door assembly shall include perimeter seal sweep strips for each side, top, and bottom, and sound liner of door manufacturer's standard for door panels. Door shall have light and sound seal at door lead posts and jamb posts.
- 2.8 Track: Track shall be steel with factory-applied corrosion-resistant finish. Track shall be recessed mounted with necessary subchannel or trim units to form pocket for ceiling mounting. Sections shall be provided in the maximum lengths practicable.



## 08000 - Doors & Windows

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- 2.9        Accessories shall be provided as follows: Center stop for bi-parting doors, track switches for door operation, and ceiling contact guard for sound-rated door units.
- 2..10     Hardware:
- 2.10.1   Components shall be heavy-duty metal pulls and latches of brass or steel with dull chromium-plated finish.
- 2.10.2   Latch shall be operable from both sides of closed door.
- 2.10.3   Deadlock shall be provided to receive cylinder, operable from both sides:
- 2.10.4   Miscellaneous Items shall be provided as follows: pendant pull in lead pose, upper draw latch with grip handle, center molding or strike for bi-parting door, and foot bolts on lead post.
- 3.0.       EXECUTION: (Section not used.)
- END OF SECTION 08350



## SECTION 08353

### ACCORDION FOLDING DOORS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of accordion folding doors. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Vinyl Covering: Fed. Spec. CCC-W-408, Type II or III, wood grain or textured.
- 2.2 Plastic Laminate: NEMA LD S, 1/16-inch minimum thickness, wood grain, patterned, or solid color finish.
- 2.3 Wood Veneer: Good grade, premium grade, or book matched hardwood as designated.
- 2.4 Framework including posts, pantographs, hinges, hinge plates, and support rods shall be either extruded aluminum or ferrous metal. Ferrous metal shall be either cadmium-plated or zinc-coated, except posts at the option of the door manufacturer shall have phosphate treatment and manufacturer's shop finish paint.
- 2.5 Pantographs: The frames on doors requiring pantographs shall be arranged for horizontal pantograph action with pantographs located at top and bottom of the frame. Intermediate pantographs spaced not over 4 feet center-to-center shall be provided for doors more than 8 feet in height. An intermediate pantograph shall be provided at the center of doors less than 8 feet high unless the door has vertical metal reinforcing. The pantographs shall operate smoothly with positive folding action and shall have a control device to prevent flattening of the folds when the panel is fully extended.
- 2.6 Hardware: Units shall be complete with grip handles, a positive latching system, and an upper latch with extended pulls if unit is over 11 feet high. Hardware shall be anodized aluminum with a natural finish or chrome plated brass.
- 2.7 Sweep strips shall be vinyl or other material which will not crack or craze with severe usage.
- 2.8 Track shall be recessed or surface-mounted and of extruded aluminum or enamel finish steel, not less than 16-gauge steel or 14-gauge aluminum. Track sections shall be provided in the maximum lengths practicable, not less than 6 feet long except for narrow doors and at ends of runs where short length is required. Suitable joint devices such as interlocking keys shall be provided at each joint to provide permanent alignment of track.
- 2.9 Metal Soffit shall be provided when track is recessed. Soffit shall be of metal of adequate thickness to protect the ceiling from damage by door operation and shall be provided with the door manufacturer's standard neutral-color applied finish. Soffits may be integral elements of ceiling track.
- 3.0 EXECUTION: (Section not used.)

END OF SECTION 08353





## SECTION 08355

### FLEXIBLE DOORS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of flexible doors. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
  - 2.1 General: Each new door unit shall be a complete unit produced by one manufacturer including hardware, accessories, mounting, and installation components.
  - 2.2 Door Panels: Door panels shall be constructed of the following materials.
    - 2.2.1 Heavy-Duty, Abrasive-Resistant Rubber, 60 durometer, roto-cured process, 2,200 psi tensile strength. Panel thickness shall be 1/2- inch.
    - 2.2.2 Flexible Polycarbonate transparent panels 1/2 inch thick.
    - 2.2.3 Flexible Polyvinylchloride (PVC) transparent panels 0.196 inch (5mm) thick.
    - 2.2.4 Flexible Polyvinylchloride (PVC) opaque panels 0.196 inch (5mm) thick.
  - 2.3 Door Panels shall be single or double-acting, as required.
  - 2.4 Panel Frame: Framing materials to which door panels shall be secured shall be galvanized steel, ASTM A525, 11 gauge. Door panels shall be suspended between L-shaped rolled formed rails and stiles by removable bolt and nut connectors.
  - 2.5 Hardware shall conform to the requirements of ASTM A164, ASTM A164, or ASTM A386, as required.
    - 2.5.1 Hinges shall be adjustable spring-type gravity self-lubricating hinges.
    - 2.5.2 Magnetic Catch shall be provided at door overlap at pair of door panels to give positive closure.
    - 2.5.3 Header and jamb Seals shall be door mounted PVC seals at head and jamb.
    - 2.5.4 Bumpers shall be center or bottom bumpers.
    - 2.5.5 Jamb Guards shall be formed steel guards to enclose and protect lower hinge hardware and closures.
  - 2.6 Door Jamb shall be constructed of steel tube, ASTM A500, with integral wall anchors, galvanized in compliance with ASTM A386 or stainless steel bent plate, Type 304, with integral wall anchors, as required.
  - 2.7 Finish: All ferrous metal parts shall be finish-coated with polyurethane paint.
- 3.0 EXECUTION: (Section not used.)

END OF SECTION 08355



## SECTION 08360

### OVERHEAD DOORS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of overhead doors. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
  - 2.1 The Manufacturer shall be a recognized producer of the type of door and accessories specified.
  - 2.2 Overhead Door - General:
    - 2.2.1 Doors shall be vertical lift type sectional door designed to slide upward to a completely overhead position. Track type shall be as directed.
    - 2.2.2 Complete Door Assemblies shall include counter balance mechanisms, weatherseals, and all other accessories necessary for complete installation.
  - 2.3 Manual Operation:
    - 2.3.1 Push-Up Operation: Doors shall have one lifting handle on each side of the door and shall be counterbalanced to provide ease of operation while raising or lowering the curtain by hand. The maximum exertion or pull required shall not exceed 25 pounds. Doors over 7 feet high shall be provided with pull down straps or pole hooks.
    - 2.3.2 Chain-Gear Operation: Chain shall be galvanized, endless type, operating over a sprocket and shall extend to within 3 feet of floor. Gears shall be high-grade gray iron, cast from machine-cut patterns. Gear reduction shall be calculated to reduce chain pull required to not exceed 35 pounds.
    - 2.3.3 Crank-Gear Operation: Crank shall be removable and located approximately 34 inches above the floor. Gears shall be of high-grade gray iron, cast from machine-cut patterns. Gear reduction shall be calculated to reduce pressure exerted on the crank to not over 35 pounds.
  - 2.4 Motorized Operation: Electric power-operated doors shall be complete with electric motors, operators, controls, switches, and safety devices.
  - 2.5 Hot-Dipped Galvanized Sheet Steel Surfaces shall be finished according to the requirements of ASTM A525 G-90. Hardware items shall as galvanized according to ASTM A153. Items galvanized after assembly shall comply with ASTM A386.
  - 2.6 Shop Prime coat of Rust-Inhibiting Paint shall comply with Fed. Spec. TT-P-86G.
  - 2.7 Tracks for Overhead Doors shall be designed to accommodate 2-inch diameter galvanized steel rollers. Tracks shall be fabricated of I3-gauge galvanized steel. Track shall have springs at the end of track to cushion the door at the end of the opening motion.



## 08000 - Doors & Windows

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- 2.8 Track Supports shall be angle iron, galvanized, and installed with cross-bracing to form a rigid construction.
- 2.9 Counterbalance shall be torsion-spring type for standard counter-balancing with tempered spring wire and continuous steel shaft. Provide case aluminum and smooth cable drums with galvanized steel lift cables. Entire counterbalance assembly shall be mounted on ball bearings.
- 3.0 EXECUTION: Panels and frames that are field repaired shall be cleaned sufficiently for good paint adherence then primed to prevent further deterioration. Galvanized coatings that are damaged shall be repaired by the application of a high zinc dust content paint formulated for regalvanizing welds in galvanized steel.

END OF SECTION 08360



## SECTION 08386

### ALUMINUM SAFETY GLASS DOORS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of aluminum safety glass doors. Products shall be directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Aluminum Safety Glass Doors shall be manufacturer's standard and shall comply with the requirements of ANSI Z97.1, Fed. Spec. DD-G1403, and the Safety Glazing certification Council (SGCC) standards for heat strengthened and fully tempered safety glass.
- 2.2 Safety Glass Doors shall have clear tempered safety glass and shall be manufacturer's stock design in standard sizes. Glazing for door tolerance shall be dimension plus 1/16 inch, minus 1/8 inch. All door glazing shall be set in aluminum frames of sufficient strength to withstand heavy duty use.
- 2.3 Finish for Aluminum Frames shall be anodized AA-C22A 41RIX or AA-M21CSSA 42RIX, as required, minimum 0.7 mil thickness with clear methacrylate lacquer coating, minimum 0.5 mil thick.
- 2.4 Hardware shall be manufacturer's standard finish to match aluminum frame door stiles and rails. Push-pull set shall be manufacturer's stock design flat plate units, approximately 6 inches by 10 inches, engraved with "push" and "pull." Custom designed push-pull (handles) set and required fittings shall be provided where required.
- 2.4.1 Lockset with Deadbolt in lower rail engaging cut-out in threshold shall be keyed from both sides. Where required, provide a lockset with deadbolt in lock side of glass door, keyed from both sides.
- 2.4.2 For Pairs of Doors, provide a deadbolt in lower rail of each door that will engage a cut-out in the threshold and key from both sides.
- 2.4.3 Where Floor Recessed Checking Floor Hinges are required, provide top pivot hardware. Where overhead closers are required, provide bottom pivot hardware. Provide checking floor hinges with sealed floor box, finished cover plate, separate adjustment screws for checking with sealed floor speed, and hold open device.
- 2.5 Threshold shall be manufacturer's standard, finished to match door rails and sized to suit door opening.
- 2.6 Anchorage and Fastenings shall be manufacturer's standard concealed. Finish heads of exposed fasteners shall match finish of adjacent metal surfaces.
- 2.7 Locate and Provide Holes and Cutouts to receive hardware before tempering safety glass. Do not permit any cutting, drilling, or other glass alterations after tempering operation.
- 3.0 EXECUTION: (Section not used.)



END OF SECTION 08386



## SECTION 08380

### SOUND RETARDANT DOORS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of material for sound retardant door. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 General:
- 2.1.1 Each Door Location shall be complete with frame and integral acoustical type hardware accessories, mounting, and installation components.
- 2.1.2 Door Unit shall conform to ASTM E90 to achieve the required Sound Transmission Classification (STC).
- 2.2 Steel Sound Retardant Doors: Door assembly shall conform to SDI 100 and A115.
- 2.3 Wood Sound Retardant Doors: Door assembly shall conform to NWMA 1.S.1, ASTM E90, AWI 900 and AWI 1300.
- 3.0 EXECUTION: Door units shall be installed complete with all necessary anchors and inserts, hardware, and other accessories. Upon completion of installation, doors shall be free from warp, twist, or distortion.

END OF SECTION 08380



## SECTION 08386

### ALUMINUM SAFETY GLASS DOORS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of aluminum safety glass doors. Products shall be directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Aluminum Safety Glass Doors shall be manufacturer's standard and shall comply with the requirements of ANSI Z97.1, Fed. Spec. DD-G1403, and the Safety Glazing certification Council (SGCC) standards for heat strengthened and fully tempered safety glass.
- 2.2 Safety Glass Doors shall have clear tempered safety glass and shall be manufacturer's stock design in standard sizes. Glazing for door tolerance shall be dimension plus 1/16 inch, minus 1/8 inch. All door glazing shall be set in aluminum frames of sufficient strength to withstand heavy duty use.
- 2.3 Finish for Aluminum Frames shall be anodized AA-C22A 41 RIX or AA-M21CSSA 42 RIX, as required, minimum 0.7 mil thickness with clear methacrylate lacquer coating, minimum 0.5 mil thick.
- 2.4 Hardware shall be manufacturer's standard finish to match aluminum frame door stiles and rails. Push-pull set shall be manufacturer's stock design flat plate units, approximately 6 inches by 10 inches, engraved with "push" and "pull". Custom designed push-pull (handles) set and required fittings shall be provided where required.
- 2.4.1 Lockset with Deadbolt in lower rail engaging cut-out in threshold shall be keyed from both sides. Where required, provide a lockset with deadbolt in lock side of glass door, keyed from both sides.
- 2.4.2 For Pairs of Doors, provide a deadbolt in lower rail of each door that will engage a cut-out in the threshold and key from both sides.
- 2.4.3 Where Floor Recessed Checking Floor Hinges are required, provide bottom pivot hardware. Provide checking floor hinges with sealed floor box, finished cover plate, separate adjustment screws for checking with sealed floor speed, and hold open device.
- 2.5 Threshold shall be manufacturer's standard, finished to match door rails and sized to suit door opening.
- 2.6 Anchorage and Fastenings shall be manufacture's standard concealed. Finish heads of exposed fasteners shall match finish of adjacent metal surfaces.
- 2.7 Locate and Provide Holes and Cutouts to receive hardware before tempering safety glass. Do not permit any cutting, drilling, or other glass alterations after tempering operation.
- 3.0 EXECUTION: (Section not used.)

END OF SECTION 08386



## 08000 - Doors & Windows

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### SECTION 08390

#### SCREEN DOORS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of screen doors. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 The Manufacturer shall be a Corpus Christi Army Depot approved producer of screen doors.
- 2.2 All Work performed shall meet the requirements of local codes and regulations.
- 3.0 EXECUTION: (Section not used.)

END OF SECTION 08390





## SECTION 08510

### METAL WINDOWS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of steel, stainless steel, and bronze windows. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- Shall comply with performance level 10 in accordance with ASTM F588.
- 2.1 Fixed Windows, Hopper Vent: Window units shall comply with SWI Recommended Specifications for Steel Windows, for standard intermediate windows with bottom hinged, swing-in type ventilator hopper sash. Bottom rails of ventilators shall have an outside drip. Hardware shall be manufacturer's standard type for each window. Ventilator shall have one pair of hinges or pivots, two stay arms, and a cam-type lever handle latch. Sash and hardware shall be designed to permit easy removal of sash from inside the building.
- 2.2 Fixed Windows: Fixed windows shall comply with the requirements of SWI Recommended Specifications for Steel Windows, for standard intermediate windows.
- 2.3 Projected Windows: Projected windows shall comply with the requirements of SWI Recommended Specifications for Steel Windows, for commercial projected windows, with project-out type ventilators, top-hinged.
- 2.5 Casement Windows: Casement windows shall comply with SWI Recommended Specifications for Steel Windows, for standard intermediate windows. Hardware for operative sash shall provide for cleaning of both sides of the sash from the inside. Operating devices shall include underscreen type rotary operators of the worm-gear type with adjustable operating arms. A continuous drip molding shall be provided above operable sash. Abutting units or combination units shall have manufacturer's stock standard mullion.
- 2.6 Awning Windows: Awning windows shall comply with the SWI Recommended Specifications for Steel Windows, for architectural awning intermediate type frame and ventilator members. Ventilators in same frame shall operate in unison. Hardware for operative sash shall provide for cleaning of both sides of the sash from the inside. Operating devices shall include underscreen type rotary operators of the worm-gear type, with adjustable operating arms. The operator shall securely close the ventilators without using additional locking devices. Ventilators shall be designed to close and be weathertight to adjoining ventilators or frame. Window frame shall be designed with rebate to receive screens.
- 2.7 Reversible Windows: Reversible horizontal pivoted windows shall comply with SWI recommended Specifications for Steel Windows, for commercial type.
- 2.8 Hinged Emergency Windows: Hinged emergency type windows shall comply with SWI Recommended Specifications for Steel Windows, for commercial type, with manual operation side or



## 08000 - Doors & Windows

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hinged for swing-out emergency exit, pivots or hinges for 90 degrees swing-out. Window shall be equipped with push-release type lever operator on window latch, complying with the requirements of local regulations for "panic hardware."

- 2.9 Double / Single hung Windows: Double and single hung windows shall comply with SWI Recommended Specifications for steel windows for commercial type. Two spiral type removable sash balances shall be provided for each sash. Balances shall be adjustable without removing sash from frame and without use of special tools. Each window 40 inches wide shall be provided with two sweep sash locks. Lower sash shall have one continuous integral lift at the bottom of the sash. The upper sash shall have a continuous integral pull down member on the meeting rail.
- 2.10 Operating Hardware: Hardware shall be provided for all operable, ventilating sash units of manufacturer's standard for the function of each individual window type specified. All operable sash shall have a latch or locking device. Hardware shall be securely attached to the window with noncorrosive bolts or machine screws.
- 2.11 Miscellaneous Hardware shall comply with Fed. Spec. FF-H-111. All metal hardware for stainless steel windows shall be non-corrodible. All hardware items for bronze windows shall match window finish.
- 2.12 Screens: Insect screens shall be full size of the operable unit. Screens shall comply with SWI Recommended Specifications and shall have removable splines of steel or vinyl. Screening shall be 18 x 14 mesh, complying with Fed. Spec. RR-W-365 for wire fabric or Fed. Spec. L-S-125, Type II.
- 2.13 Weatherstripping shall be the standard type for use with the window unit supplied and shall be easily replaceable.
- 2.14 Materials for steel windows shall comply with the requirements of the following:
- a. Sheet steel: Fed. Spec. QQ-S-700.
  - b. Zinc-coated steel: ASTM A90, A123, or A386.
  - c. Zinc-coating on hardware: ASTM A153.
  - d. Corrosion-resistant steel: Fed. Spec. QQ-S-766.
- 2.15 Materials for Stainless Steel Windows shall comply with the requirements of ASTM A167.
- 2.16 Materials for Bronze Frames shall comply with the requirements of ASTM B97, ASTM B100, ASTM B150 or ASTM B169.
- 3.0 EXECUTION: Window units shall be installed complete with all necessary anchors, hardware, and other accessories and shall be plumb, square, and level in alignment, and braced and stayed properly to prevent distortion and misalignment.

END OF SECTION 08510



## SECTION 08520

### ALUMINUM WINDOWS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of aluminum windows. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

#### 1.1 Submittals

1.1.1 Product Data: Submit manufacturer's specifications, recommendations and standard details for aluminum window units, including certified test laboratory reports as necessary to show compliance with requirements.

1.1.2 The Contractor shall include in this package copies of the independent laboratory tests which certify that the proposed product meets or exceeds the AAMA classification as specified herein.

1.1.3 Shop Drawings: Submit shop drawings, including location floor plans or exterior wall elevations showing all window openings, typical unit elevations at 3/4 inch scale, and full size detail sections of every typical composite member. show anchors, hardware, operators and other components not included in manufacturer's standard data. Include glazing details and standards for factory glazed units. Include method of installing and attaching to building all specified work in accordance with manufacturers recommendations and applicable laws.

1.1.4 Samples: Submit samples as follows:

- a. One sample of each required aluminum finish on 12 inch long sections of extrusion shapes and aluminum sheets as required for window units.
- b. Additional samples if and as directed by the Contracting Officer to show fabrication techniques, workmanship of component parts and design of hardware and other exposed auxiliary items.
- c. One window complete with hardware, glazing, and all accessories. Include window shade.
- d. Upon approval, this window shall be installed.
- e. Window Guard

#### 2.0 PRODUCTS

Shall comply with performance level 10 in accordance with ASTM F588.

2.1 Windows shall meet the requirements of AAMA as follows:

Double Hung	C 40-50
	HC 60-65
Casement	HC 65
Horizontal Sliding	C 40-50



## 08000 - Doors & Windows

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HC 45-50

Fixed

C 40-50

HC 65

As manufactured by:

1. Graham Architectural Products Corporation.
2. TRACO.
3. Peerless
4. Acorn Building Components, Inc.
5. EFCO Corporation.
6. Or equal

2.2 Window types (Operation): Unless otherwise specified, all sash shall be double hung operable.

2.2.1 Fixed aluminum windows or panel frames: Except for hopper vents (if any) or special provisions as indicated for maintenance, cleaning and removal, no operating hardware or equipment is required.

2.2.2 Double-hung aluminum windows (DH): Units containing two balanced vertically sliding sash, requiring four (4) counter balancing mechanisms per sash complying with AAMA 902 "Sash Balance Specifications," and as specified hereinafter, lift handles on lower rail of lower sash, pull down handle on top of rail of upper sash if operable.

- a. Provide units which have "lift-out" feature permitting easy removal of both sash from inside without special tools.
- b. Windows which are tilt-in type sash shall not be acceptable for this project.
- c. Provide block and tackle type balances, spiral balances will not be acceptable on this project.

2.2.3 Other styles of new sash specified herein shall operate in the same manner as existing and have comparable hardware and plastic glazing.

### 2.3 Materials

2.3.1 Aluminum Extrusions: Alloy and temper recommended by window manufacturer for strength, corrosion resistance and applications of required finish, but not less than 22,000 psi ultimate tensile stress, a yield stress of 16,000 psi. Comply with ASTM B 221.

2.3.2 Fasteners: Aluminum, non-magnetic stainless steel, or other materials warranted by manufacturer to be non-corrosive and compatible with aluminum window members, trim, hardware, anchors and other components of window units.

- a. Reinforcement: Where fasteners screw-anchor into aluminum less than 0.125 in. thick, reinforce interior with aluminum or non-magnetic stainless steel to receive screw threads, or provide standard non-corrosive pressed-in splined grommet nuts.



- b. Do not use exposed fasteners on exterior except where unavoidable for application of hardware. Match finish of adjoining metal.
  - c. Provide non-magnetic stainless steel Phillips flat-head machine screws for exposed fasteners, where required, or special tamper-proof fasteners.
  - d. Locate all fasteners so as not to disturb the thermal break construction of windows.
- 2.3.3 Anchors, clips and window accessories: Depending on strength and corrosion- inhibiting requirements, fabricate units of aluminums, non-magnetic stainless steel, or hot-dip zinc coated steel or iron complying with ASTM A386.
- 2.3.4 Compression glazing strips and weatherstripping: At manufacturer's option, provide molded neoprene gaskets complying with ASTM D 2000 Designation 2BC415, PVC gaskets complying with ASTM D2287, or expanded neoprene gaskets complying with ASTM C509, Grade 4.
- 2.3.5 Sliding weatherstripping: Provide woven pile weatherstripping of polypropylene or nylon pile and resin-impregnated backing fabric, and mylar fin, comply with AAMA 701. Provide double weatherstripping at sills using silicone coated woven pile with mylar side fins.
- 2.3.6 Sealant: Unless otherwise indicated for sealants required within fabricated window units, provide elastomeric type as recommended by window manufacturer for joint size and movement, to remain permanently elastic, non-shrinking and non-migrating. Provide product complying with AAMA Specification 803.2 and 808.1.
- 2.4 Fabrication and Accessories
- 2.4.1 Provide manufacturer's standard fabrication and accessories which comply with Specifications indicated standards and are reglazable without dismantling of sash framing, except to extent more specific or more stringent requirements are indicated. Include complete system for assembly of components and anchorage of window units and prepare complete preglazing at factory.
- 2.4.2 Window members: All window members, including muntin bars, shall be of aluminum. Secondary members, such as friction tabs, shoes, weatherstripping guides etc., shall be of aluminum or material compatible with aluminum.
- 2.4.3 Window members continued.
- a. Main frame and sash members shall have a nominal thickness of not less than .094 inches, except for fin trim either integral or applied. Frame sill member shall have a nominal thickness of not less than .125 inches and shall be welded at the corners to the jamb frame members. The standard wall thickness tolerance as defined by the Aluminum Association shall apply.
  - b. The master frame shall be no less than 4-1/2 inches in depth. The inserts shall have hollow extruded horizontal sections and shall be no less than 1-7/8 inches in thickness.
  - c. Window members supporting window cleaner's anchor bolts shall be capable of withstanding the impact fall of a window cleaner as required in the ANSI 839 Standard (latest edition).
- 2.4.4 Thermal break: The thermal barrier shall provide a continuous uninterrupted thermal break around the entire perimeter of the frame and all sash and shall not be bridged by any metal conductors at any point.



## 08000 - Doors & Windows

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- 2.4.5 Hardware: Hardware having component parts which are exposed shall be of aluminum, stainless steel or other non-corrosive materials compatible with aluminum. Cadmium or zinc-plated steel where used must be in accordance with ASTM A165 or A164.
- 2.4.6 Mullions: Other structural members, when mullion units occur, whether they are joined by integral mullions, independent mullions, or by a combination of frame members, the resulting members must be capable of withstanding the load outlined under Uniform Load specified load requirements, without deflecting more than 1/175th of its span. When independent or integral mullions are used to join windows, the mullions shall contain a thermal break as specified. Evidence of compliance may be by mathematical calculations; and in addition must also pass window cleaner anchor bolt drop test.
- 2.4.7 Balances: Balances of appropriate size and capacity to hold both top and bottom sash stationary in open position shall be used. Sash balances shall be easily accessible and replaceable in the field without the use of special tools.
- 2.4.8 Sash
- a. Sash shall be joined at the corners with two screws in integral screw ports.
  - b. The sash must be easily removed from the frame for either cleaning or repair. Reglazing shall be accomplished with the aid of standard glazing tools.
- 2.4.9 Assembly: The windows shall be assembled in a secure and workmanlike manner to perform as hereinafter specified. All joints of the main frame and the sash shall be butt type, coped and joined neatly and secured by means of screws anchored in integral ports. The main frame at the sill shall be sealed on the outside with an narrow joint sealant meeting AAMA 8034.3 specification for narrow joint sealant. The main frame and sill members shall be welded in compliance with AAMA 302.9 A.4 specification.
- 2.4.10 All sash shall be of screwed together construction so that they may be easily repaired. The meeting rails of the top and bottom sash shall interlock in the closed position. The meeting rail interlock shall consist of two separate and distinct metal interlocks containing a fin-seal, as an integral part of both metal interlocks.
- 2.4.11 Thermal-Break Construction: Fabricate aluminum window units with an integrally concealed low conductance thermal barrier-exposed on interior, in manner which eliminates direct metal-t-metal contact. Provide manufacturer's standard construction which has been in use on similar window units for a period of not less than three (3) years and has been tested to demonstrate resistance to thermal conductance and condensation, and has been tested to show adequate strength and security of glass retention.
- 2.5 Quality Assurance
- 2.5.1 Standards: Except as otherwise indicated, requirements for aluminum windows, terminology and standards of performance, and fabrication workmanship are those specified and recommended in ANSI/AAMA 101 for type and classification of window units required in each case.
- 2.5.2 Performance and Testing: Except as otherwise indicated, comply with air infiltration tests, water resistance tests, and applicable load tests specified in ANSI/AAMA 101 for type and classification of window units required in each case.



- 2.5.3 Testing: Where manufacturer's standard window units comply with requirements and have been tested in accordance with specified tests provide certification by manufacturer showing compliance with such tests; otherwise, perform required tests through a recognized testing laboratory or agency, approved in advance by the Contracting Officer and provide certified test results.
- a. Test reports shall not be more than four years old.
  - b. Note Well: Sample submitted for tests shall be of manufacturer's standard construction and at least 5 feet 6 inches wide by 10 feet 0 inches high, containing sash whose overall dimensions shall be at least 5 feet 2 inches by 4 feet 7 inches. The sequence of test shall be optional between manufacturer and the testing laboratory except that in all cases, the air infiltration test shall be performed before the water resistance test.
- 2.5.4 Specific Performance Requirement Windows shall conform to specified ANSI/AAMA standards and following ,whichever are the more stringent:
- a. Air Infiltration Test: With the sash in a closed locked position, the window shall be subjected to an air infiltration test in accordance with ASTM E 283. Air infiltration shall not exceed .37 cubic feet per minute at 1.57 pci of crack length. The sash shall have been adjusted to operate in either direction with a force not exceeding 45 pounds after the sash is in motion.
  - b. Water Resistance Test: The glazed unit shall be mounted in its vertical position continuously supported around the perimeter and the sash placed in the fully closed and locked position. The window unit shall be subjected to water resistance test in accordance with ASTM E 331. When a static pressure of 9.75 pounds per square foot has been stabilized, five gallons of water per square foot of window area shall be applied to the exterior face of the unit for a period of 15 minutes. No water shall pass the interior face of the window frame and there shall be no leakage as defined in the test method.
  - c. Uniform Load Structural Test: A minimum exterior and interior uniform load 97.5 pounds per square foot shall be applied to the entire surface of the test unit. This test load shall be maintained for a period of 10 seconds.
  - d. At the conclusion of tests, there shall be no glass breakage permanent damage of fasteners, hardware parts, support arms, actuating mechanisms, or any other damage causing the window to be inoperable. There shall be no permanent deformation of any frame or sash member in excess of 0.4 percent of its span.
  - e. Condensation Resistance Factor: The window shall be tested in accordance with AAMA 1502.7 standards and tests of thermal performance, and shall have condensation resistance factor of no less than 45.
  - f. "U" Value Tests: (Co-efficient of Heat Transfer):
  - g. Thermal Transmittance of Conduction with a 15 mph perpendicular dynamic wind: 0.69 BTU/hr/ft (squared) / F
- 2.6 Product delivery, storage and handling
- a. Store and handle windows, mullions, panels, hardware and all appurtenant items in strict compliance with the manufacturer's instructions.





## 08000 - Doors & Windows

- b. Protect units adequately against damage from the elements, construction activities and other hazards before, during and after installation.

### 2.7 Special project warranties

- a. Manufacturer's Warrantees: Submit written warrantees from window manufacturer for the following:
- b. Windows: Windows furnished are certified as fully warranted against any defects in material or workmanship under normal use and service for a period of one (1) year from date of final acceptance.
- c. Finish: The pigmented organic finishes windows and component parts (such as panning trim, mullions and the like) are certified as complying fully with requirements of ASTM Section 603.6 for pigmented organic coating and fully warranted against chipping, peeling, cracking or blistering for a period of ten (10) years from date of installation.
- d. Glazing: 5 year written warranty against breakage and coating delamination.

### 2.8 Not Used.

### 2.9 Glass and Glazing: Refer to Section 08810.

### 2.10 Casing cover system

- 2.10.1 Exterior casing covers: Provide extruded prime alloy aluminum 6063-T5 or no less than nominal .078 inch wall thickness. Casing covers of less than 2 inches in depth from the window frame may be of .062 inch wall thickness. Aluminum sections shall be of one piece designed to lock around the entire window frame for a weathertight connection but allow unrestricted expansion and contraction of casing cover members and window frames. At locations where louvers, grilles, panels etc. exist within same masonry opening as windows specified for replacement, provide .062 casing cover.

- a. The casing cover section shall be secured at the corners with stainless steel screws in integral screw ports with the joints back sealed using a good quality sealant.
- b. Exposed screws, fasteners or pop rivets are not acceptable on the exterior of the casing cover system.

- 2.10.2 Exterior mullion covers: Exterior mullion covers shall be of extruded aluminum shape to provide rigidity. The wall thickness shall be no less than nominal 0.062 inches thick. The seal against the casing cover sections shall be accomplished by a continuous bulbous vinyl weatherstripping which is interlocked within the mullion cover. Omit casing cover on masonry mullions. Where existing windows have extra wide sills and reveal liners, new panning shall be custom designed to cover them completely, but retain the shape as required by the Corpus Christi Army Depot.

- 2.10.4 Interior trim: Interior trim, closures and angles shall be specified as detailed and of extruded shapes. They shall be no less than .062 inch nominal wall thickness.

- a. Snap trim shall be supplied in required lengths and attached with clips spaced no more than 18 inches on center. On all interior trim, no exposed screws will be allowed.
- b. Break metal where required shall be a nominal thickness of .062 aluminum.

### 2.11 Aluminum Window Finishes





## 08000 - Doors & Windows

- 2.11.1 Organic coating: Provide organic coating of type and color indicated or selected by Bureau of Engineering from manufacturers standard colors, testing and certified by window manufacturer to comply with AAMA 603.6, shop applied.
- 2.11.2 Provide manufacturer's standard acrylic or polyester, baked-on, electostatically applied enamel coating of 1.0 ±.2 mills dry film thickness (minimum), of manufacturer's standard color (s) as selected by the Bureau of Engineering, applied over manufacturer's standard substrate proportion including cleaning, degreasing, and chromate conversion coating.
- 2.12 Insect Screens:
  - 2.12.1 Furnish and install insect screens on exterior face of exterior windows.
  - 2.12.2 Screens shall cover the full window opening. Frames for screens shall be of extruded aluminum corners welded and ground smooth with finish to match color of window frames.
  - 2.12.3 Extruded aluminum frames to be of 60-63-T5. Spline to be removable of solid extruded plastic.
  - 2.12.4 Channel guides for aluminum screen shall be extruded aluminum 60-63-T5.
  - 2.12.5 Frame sizes shall be 7/16 x 1" where screen sizes do not exceed 18 sq. ft. Screens over 18 sq. ft. shall be 7/16 x 1-1/2" frames. Where width of screens are more than 54 inches provide 7/16 x 1" double vertical rewirable brace.
  - 2.12.6 Provide stainless steel tension springs and aluminum lifts for all screens. The upper screen shall have a concealed spring bolt in the bottom rail, to assure that the upper screen shall not slide down by its weight.
  - 2.12.7 Wire cloth may be 18 x 14 or 18 x 16, aluminum, .011 dia.
  - 2.12.8 Screens shall be as manufactured by Kane Manufacturing Corp., Kane, Pennsylvania; Watson Manufacturing Co., Inc., Jamestown, N.Y., or approved equal. Submit samples for approval.
- 3.0 EXECUTION
  - 3.1 Installations
    - 3.1.1 Comply with manufacturer's specification and recommendations for installation of window units, hardware, operators and other components of work. In no case shall attachment to existing structure or to components of the window system be through or effect the thermal barrier of the replacement windows.
    - 3.1.2 Set units plum, level and true to line, without warp or rack of frames or sash. Anchor securely in place. Separate aluminum and other corrodible surfaces from sources of corrosion of electrolytic action.
    - 3.1.3 Wedge insulation between frames of new windows and construction to remain, or between frames and new blocking as applicable.
    - 3.1.4 Installation schedule must be submitted and approved by the Contracting Officer.
    - 3.1.5 Adjust operating sash and hardware to provide tight fit at contact points and at weatherstripping, for smooth operation and weathertight closure.



## 08000 - Doors & Windows

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- 3.1.6 Clean aluminum surfaces promptly after installation of windows, exercising care to avoid damage to protection coatings and finishes. Remove excess glazing and sealant compounds, dirt, and other substances. Lubricate hardware and moving parts.
- 3.1.7 Clean glazing promptly after installation of windows. Remove glazing and sealant compound, dirt and other substances.
- 3.1.8 Initiate all protection and other precautions required to ensure that window units will be without damage or deterioration (other than normal weathering) at time of acceptance.
- 3.1.9 Contractor shall submit written recommendations for maintenance and protection of windows following installation.
- 3.2 New Shades:
  - 3.2.1 Window shades for upper and lower sashes, complete with side operated brackets, pulleys slats, cords and all other necessary accessories for installation. Color as specified by the Contracting Officer.
- 3.3 Window guard work:
  - 3.3.1 Remove the existing window guards as required to install new windows. Upon completion, reinstall all window guards as follows:
    - a. Interior guards shall be carefully removed, tagged, stored in area designated by Custodian, and reinstalled after new window is installed. Guards shall be altered to fit new window. Contractor shall supply any required accessories or hardware for a complete approved reinstallation. Guards shall be removable so custodian can perform clean up requirements.
    - b. Exterior guards presently secured to removed window frame shall be removed and stored in work space. After new window frame and sash complete with exterior trim are installed the removed window guards shall be altered and modified as required to suit new conditions. End angles shall be reinstalled on masonry reveals and tees installed on sills and head lintel with clip angle supports. Leg of clip angles shall be two inches, each leg secured with two screws or bolts to suit existing conditions.
    - c. Exterior Guard frames presently secured to masonry reveals may be left in place of window removals and new installations can be satisfactory performed. Temporarily support, or if required, remove panels and tees and reinstall panels and tees on masonry sills and lintels with clip angle supports after new windows are installed. If entire guards must be removed, follow same removal and reinstallation procedure as outlined above.
    - d. Do not secure any exterior guards to windows or frames.
- 3.3.2 Submit Shop Drawings showing required alterations for Contracting Officer approval.
- 3.3.3 Expanded metal window guards:
  - a. Heavy duty metal galvanized exterior window, two-piece guards complete with frames, supports and hardware.
  - b. Mount guards on masonry reveals. Do not attach new guards to windows. Guards must be close fit at top, bottom and both sides.



## 08000 - Doors & Windows

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- c. Guards shall be fabricated as follows frames: 1-1/2" x 1-12"" x 1/4" 2/77 lb. angles mitered welded and ground smooth for one piece construction.
- d. Fabric shall be galvanized carbon steel expanded metal, style 1/2" - No. 13, 1.75 lbs. per square foot. Fabric shall be as manufactured by Special Sections Inc., Bronx, NY, or approved equal.
- e. Supports: 1/4" thick angles and/or tees at jamb and mullions and be secured in place at intervals not over 18" and at top and bottom with 1/4" clip angles and 3/8" dia. expansion bolts.
- f. Hardware: All snap books shall be protected by 8" x 8" anti pick plates. Weld 1-1/2" pair of hinges mounted with 1/4" dia. minimum bolts, peen bolts. Weld hasps to pick plates.
- g. Box out to fully enclose existing air conditioners.

END OF SECTION 08520



## 08000 - Doors & Windows

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### SECTION 08520a

## ALUMINUM REPLACEMENT WINDOWS

### PART 1 - GENERAL

#### 1.01 SUMMARY

##### A. Section Includes:

1. Field Survey: Prior to bid submission, the Contractor shall field measure all masonry openings scheduled for aluminum replacement windows and provide a complete and accurate tabulation of all proposed window types and sizes as part of his price proposal. The Contractor shall also provide, as a separate document, a breakdown of window types and sizes per dwelling unit, identified by street address and house number, with applicable replacement costs attached thereto, so as to permit the Corpus Christi Army Depot to determine and evaluate aggregate window replacement costs per dwelling unit. Coordinate field measurement with Section 1.11- Project Conditions, hereinafter.
2. Demolition Work: Remove existing windows; panels below [and above] windows; flashings; exterior and interior trim at head, jambs and sills; precast concrete sills at bottom of masonry openings; and any/all construction debris from site in accordance with Section 01120 - Alteration Project Procedures.
3. New Work: Supply and install new aluminum replacement windows:
  - a. Material: aluminum windows with hardware and related components as shown on drawings and/or specified in this section.
  - b. Installation: all labor materials, tools, equipment, and services needed to furnish and install aluminum windows.
  - c. Glass and glazing.
  - d. Perimeter sealing and caulking.
  - e. Other Work : Coordinate the work of other trades with the work of this Section, included but not limited to the installation of vapor barriers and flashings, rough and finish carpentry.

#### 1.02 PRODUCTS FURNISHED BUT NOT INSTALLED

- ##### A. Deliver extra materials to the Corpus Christi Army Depot. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with appropriate labels
1. Furnish five percent of sash per window type as scheduled, shown on drawings, or otherwise specified, but not less than one [1] to be supplied and stored for future needs. Five percent of every size and color



2. Furnish ten percent half screens of each size scheduled, shown on drawings, or specified, but not less than one [1]; mounted complete with extruded aluminum tubular frame, to be supplied and stored for future needs.

#### 1.03 REFERENCES

##### A. AAMA - American Architectural Manufacturers Association

1. AAMA 502-90 "Voluntary Specification for Field Testing of Windows and Sliding Glass Doors"
2. AAMA 603.8-92 "Voluntary Performance Requirements and Test Procedures for Pigmented Organic Coatings on Extruded Aluminum"
3. AAMA 605.2-92 "Voluntary Specification for High Performance Organic Coatings on Architectural Aluminum Extrusions and Panels"
4. AAMA 607.1-77 "Voluntary Guide Specification and Inspection Methods for Clear Anodic Finishes for Architectural Aluminum"
5. AAMA 608.1-77 "Voluntary Guide Specification and Inspection Methods for Electrolytically Deposited Color Anodic Finishes for Architectural Aluminum"
6. AAMA 701-92 "Voluntary Specification for Pile Weatherstripping"
7. AAMA 800-92 "Voluntary Specifications and Test Methods for Sealants"
8. AAMA 1502.7-81 "Voluntary Test Method for Condensation Resistance of Windows, Doors, and Glazed Wall Sections"
9. AAMA 1503.1-88 "Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors, and Glazed Wall Sections"
10. AAMA CW-10 "Care and Handling of Architectural Aluminum from Shop to Site"

##### B. ANSI - American National Standards Institute

1. ANSI/AAMA 101-93 "Voluntary Specifications for Aluminum and Poly Vinyl Chloride PVC Prime Windows and Glass Doors"

##### C. ASTM - American Society for Testing and Materials

1. ASTM C 1036-91 "Standard Specification for Flat Glass"
2. ASTM C 1048-91 "Standard Specification for Heat-Treated Flat Glass"
3. ASTM E 90-90 "Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions"
4. ASTM E 283-91 "Standard Test Method for Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors"
5. ASTM E 330-90 "Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference"
6. ASTM E 331-86 "Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference"



## 08000 - Doors & Windows

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7. ASTM E 547-86 "Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Cyclic Static Air Pressure Differential"
8. ASTM E 774-88 "Specification for Sealed Insulating Glass Units"

### 1.04 SYSTEM DESCRIPTION

- A. AMA Designation: HS-C50.
- B. Windows: 3 1/4" frame depth; extruded aluminum with integral structural polyurethane thermal break in the frame and sash members; equal-leg frame; finish factory-applied; frames and sash factory-assembled.
- C. Configuration: horizontal sliding; single slide XO or OX, with exterior sash fixed with screws and jamb lock removed; continuous head and sill in multiple window configurations; with 1" opaque insulated metal panels in fixed frames at lower sections under windows; metal panel description in paragraph 2.05.
- D. Glazing: 3/4" insulating glass; glass description in paragraph 2.04; reuseable flexible black PVC channel gasket with weep holes; factory-glazed.

### 1.05 PERFORMANCE REQUIREMENTS

- A. Conformance to HS-C50 specifications in ANSI/AAMA 101-93 when tests are performed on the prescribed 8'-0" x 5'-4" minimum test size with the following test results:
  1. Air Infiltration: maximum .09 cfm/ft of sash perimeter when tested per ASTM E 283-91 at a static air pressure difference of 1.57 psf.
  2. Water Penetration: no uncontrolled water leakage when tested per ASTM E 547-86 and ASTM E 331- 86 at a static air pressure difference of 8 psf.
  3. Uniform Structural Load: no glass breakage, permanent damage to fasteners or hardware or any other damage which would cause the window to be inoperable, and maximum .4% permanent deformation of the span of any frame or sash member when tested per ASTM E 330-90 at a static air pressure difference of 75 psf.
- B. Thermal testing per AAMA 1502.6-76, at the prescribed 3'-2" x 3'-10" test size glazed with 3/4" insulating glass made with 1/8" clear lites, with the following test results:
  1. Condensation Resistance Factor: minimum 48 CRF.
  2. Thermal Transmittance: maximum.62 BTU/HR/SQ.FT/F U value.

### 1.06 SUBMITTALS

- A. Shop drawings for each type of window required. Include information not fully detailed in manufacturer's standard product data and the following:
  1. Layout and installation details, including anchorage details, and clearance between frame and rough opening.
  2. Elevations of continuous work at 1/4-inch scale and typical window unit elevations at 3/4-inch scale.
  3. Full-size section details of typical composite members, including reinforcement.



4. Hardware including operators.
  5. Glazing details.
  6. Accessories.
- B. Product data for each type of window required, including manufacturer's specifications, test reports from an AAMA-accredited laboratory, and standard details verifying conformance with specifications, to include:
1. Construction details and fabrication methods.
  2. Profiles and dimensions of individual components.
  3. Data on hardware, accessories, and finishes.
  4. Recommendations for maintenance and cleaning of exterior surfaces.
- C. Samples:
1. Submit full set of finish color samples to Architect for color selection.
  2. Windows and frames: submit one complete typical full size window representing the window being bid [with color being the only exception], with sash[es], glazing, screen[s], and specified hardware; or two 12 x 12 inch full scale samples of specified pre-finished aluminum surfaces; window screen material with frame; and glazing materials, illustrating glass units, coloration, and design.
  3. Insulated metal panels: submit two samples of panel construction, 12 x 12 inch in size cut from top and bottom corner of panel, illustrating pre-finished panel color[s] and surface texture[s], and specified core material.
  4. Samples for Verification Purposes: The Corpus Christi Army Depot reserves the right to require additional samples that show fabrication techniques and workmanship, and design of hardware and accessories.
- D. Quality Assurance / Control Submittals: Submit to Architect / C.O.T.R.:
1. Furnish a valid AAMA Notice of Product Certification indicating that the windows for the project conform to ANSI/AAMA 101, and comply with HUD UM 39a, HUD UM 82, ANSI Z34.1, and HUD 24 CFR 200.935.
  2. Manufacturer's Installation Instructions: Indicate special installation instructions and any special precautions required. Demonstrate to the Contracting Officer Project Personnel and/or representatives all measures and techniques required for on-site replacement of glazed sash, insect screen, operating hardware, and other applicable product parts; as well as general repair procedures, and all maintenance procedures.
- E. Closeout Submittals: Submit to Architect / C.O.T.R.:
1. Operation and maintenance data.
  2. Special warranty, as described in Paragraph 1.13 WARRANTY.

### 1.07 QUALITY ASSURANCE



## 08000 - Doors & Windows

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- A. Manufacturer Qualifications: Company specializing in manufacturing aluminum sliding window systems with minimum ten (10) years documented experience.
- B. Installer Qualifications: Engage an experienced Installer who has completed installation of aluminum windows similar in design and extent to those required for the project and whose work has resulted in construction with a record of successful in-service performance.
- C. Single-Source Responsibility: Provide aluminum window units from one source and produced by a single manufacturer.
- D. Design Concept: The drawings and/or shop drawings indicate the size, profiles, and dimensional requirements of the aluminum window types required and are based on the specific type and model indicated. Aluminum windows by other manufacturers may be considered provided deviations in dimensions and profiles are minor and do not change the design concept as judged by the Architect. The burden of proof of equality is on the proposer. The final decision on equality of product shall be made by the District of Columbia Housing Authority.
- E. For proposed product substitutions, submit for pre-bid qualification approval prior to proposal submission:
  - 1. Valid test reports from an AAMA-accredited laboratory conforming completely to test results in Paragraph 1.06.
  - 2. Acceptance will be by written approval only; no verbal approvals will be given.
  - 3. Submit bids based only on pre-qualified "equal" products as confirmed in a pre-bid written addendum. Bidder must identify manufacturer and model number of pre-qualified product on which bid is based.
- F. Furnish visible, permanent I GCC certification labels for the CB A rating level on dual-seal double insulating glass units.
- G. Regulatory Requirements:
  - 1. Egress Requirements: Comply with applicable codes and regulations.
  - 2. Provide emergency egress, single point locking release, and bit key lock fire entry from exterior as and where required by applicable codes and regulations.
  - 3. Accessibility:
    - a. Architectural Barriers Act of 1968 as amended (42 USC 4152-4157) and HUD implementing regulations (24 CFR Part 40).
    - (1) Uniform Federal Accessibility Standards (UFAS).
    - b. Section 504 of the Rehabilitation Act of 1973 as amended (29 USC 794) and HUD implementing regulations 24 CFR Part 8.
    - c. Fair Housing Accessibility Guidelines (24 CFR Chapter 1).
    - d. Americans with Disabilities Act of 1990 (ADA) (28 CFR Part 35).
- H. Mock-up requirements: Supply and Install Contract: Prior to installing aluminum replacement window systems, construct one full size mock-up of window system, with specified finish[es], required to verify selections made under Samples submittal and to demonstrate aesthetic effects





## 08000 - Doors & Windows

as well as qualities of materials and execution. The mock-up shall be installed by the Contractor who is contracted to install all remaining windows for the project. Build mock-ups to comply with the following requirements, using materials indicated for the Work.

1. Locate mock-ups on-site in the location and of the size indicated or, if not indicated, as directed by Architect / C.O.T.R.
2. Notify the Architect / C.O.T.R. 7 days in advance of the dates and times when mock-ups will be constructed. Mock-ups shall demonstrate the proposed range of aesthetic effects and workmanship.
3. Obtain Architect's approval of mock-ups before start of Work.
4. Retain and maintain mock-ups during construction in an undisturbed condition as the standard for judging the completed Work.
5. Approved mock-ups in an undisturbed condition at the time of Substantial Completion may become part of the completed Work.

### 1.08 PRE-INSTALLATION CONFERENCE:

- A. Conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings". Convene one week prior to commencing work of this Section. Review methods and procedures related to aluminum replacement window systems including, but not limited to, the following:
  1. Inspect and discuss condition of substrate and other preparatory work performed by other trades.
  2. Review structural loading limitations.
  3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
  4. Review required inspecting, testing, and certifying procedures.
  5. Review weather and forecasted weather conditions and procedures for coping with unfavorable weather conditions.

### 1.09 ENVIRONMENTAL REQUIREMENTS

- A. Do not install sealants when ambient temperature is less than 40 degrees Fahrenheit during and 48 hours after installation.

### 1.10 DELIVERY, STORAGE, AND HANDLING

- A. Packing, Shipping, Handling, and Unloading: Pack materials at manufacturing plant to prevent damage during shipping. Handle windows and accessories in accordance with AAMA CW-10.
  1. Aluminum Replacement Windows: Label in accordance with HUD UM39a attached signifying compliance with ANSI / AAMA 101 performance requirements.
  2. Thermally Improved Windows: Label in accordance with HUD UM 39a attached signifying compliance with specified AAMA 1504 performance requirements.
- B. Acceptance at Site: Inspect aluminum replacement windows upon delivery. Replace damaged or defective materials before installation.



## 08000 - Doors & Windows

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- C. Storage and Protection: Store aluminum replacement windows in manner to protect from the elements, construction activities, and other hazards until project completion.

### 1.11 PROJECT CONDITIONS

- A. Field Measurements: Check actual window openings by accurate field measurement before fabrication. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of Work.

### 1.12 SCHEDULING AND SEQUENCING

- A. Scheduling and Completion: Comply with requirements of Section 01010 - Summary of Work.
- B. Coordinate the Work with the installation of air and vapor barrier, and structural components or materials.

### 1.13 WARRANTY

- A. Aluminum Window Warranty: Submit a written warranty covering materials and installation for aluminum replacement windows, executed by the window manufacturer, agreeing to repair or replace window units that fail in materials or workmanship within the specified warranty period. Include coverage of inserts, hardware, and latches.
  - 1. Windows: warrant for one year against defects in material or workmanship under normal use.
  - 2. Organic finish conforming to AAMA 603.8-92: warrant for ten years against chipping, peeling, cracking, or blistering.
  - 3. Organic finish conforming to AAMA 605.2-92: warrant for fifteen years against chipping, peeling, cracking, blistering, chalking or fading.
  - 4. Dual-seal double insulating glass units: warrant seal for five years against visual obstruction resulting from film formation or moisture collection between the internal glass surfaces, excluding that caused by glass breakage or abuse. Glazing materials shall comply with CPSC 16 CFR 1201 or ANSI Z97.1.

Failures include but are not necessarily limited to:

- 1. Structural failures including excessive deflection, excessive leakage, or air infiltration.
    - 2. Faulty operation of sash and hardware.
    - 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
- B. Items Not Included:
  - 1. Screening, glazing, and other product defects resulting from vandalism.
- C. For Supply and Delivery Only Contract: Equivalent to five percent of installed and supplied items
  - 1. Contractor agrees to supply and deliver to the Contracting Officer, free of charge, any required replacement parts than can be readily installed by the Contracting Officer without special tools.



## 08000 - Doors & Windows

2. Contractor agrees to supply and deliver free of charge complete replacement window[s] when defective part or parts cannot be installed without the use of special tools.
- D. For Supply and Install Contract: Contractor agrees to supply and install, free of charge, any required replacement parts or complete window replacement.
- E. The warranty shall not deprive the Owner of other rights or remedies that the Owner may have under other provisions of the Contract Documents and is in addition to and runs concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

### PART 2 - PRODUCTS

#### 2.01 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to, the following:

Windows shall meet the requirements of AAMA as follows:

Double Hung	C 40-50 HC 60-65
Casement	HC 65
Horizontal Sliding	C 40-50 HC 45-50
Fixed	C 40-50 HC 65

As manufactured by:

1. Graham Architectural Products Corporation.
2. TRACO.
3. Peerless
4. Acorn Building Components, Inc.
5. EFCO Corporation.
6. Or equal

#### 2.02 MATERIALS

- A. Aluminum extrusions: Produced from commercial quality 6063-TS alloy; free from defects impairing strength, durability, corrosion resistance, and application of required finish; but not less than 22,000 psi ultimate tensile strength and not less than 0.062 inch thick at any location for main frame and sash members.
- B. Fasteners: Provide aluminum, nonmagnetic stainless steel, epoxy adhesive, or other materials warranted by the manufacturer to be noncorrosive and compatible with aluminum window members, trim, hardware, anchors, and other components of window units.
  1. Reinforcement: Where fasteners screw-anchor into aluminum less than 0.125 inch thick, reinforce the interior with aluminum or nonmagnetic stainless steel to receive screw threads or provide standard noncorrosive pressed-in splined grommet nuts.



## 08000 - Doors & Windows

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2. Exposed Fasteners: Except where unavoidable for application of hardware, do not use exposed fasteners. For application of hardware, use fasteners that match the finish of the member or hardware being fastened, as appropriate.
- C. Hardware:
1. Two polycarbonate wheel housings per sash with two ball bearing plated steel wheels per housing; wheel housings mounted in fabricated slots in the bottom rail of each sash; one black zinc automatic handle/lock mounted with stainless steel screws and one black zinc keeper on meeting stiles; one black aluminum automatic handle/lock on the stile of the exterior sash to engage the frame jamb when the exterior sash is in the closed position.
  2. Provide "night latch" at all windows.
- D. Anchors, Clips, and Window Accessories: Fabricate anchors, clips, and window accessories of aluminum, nonmagnetic stainless steel, or hot-dip zinc-coated steel or iron complying with the requirements of ASTM B 633; provide sufficient strength to withstand design pressure indicated.
- E. Weatherstrip: secured in extruded ports; double rows on sash perimeters: rigid PVC weatherseal in one side of the horizontal sash rails, and pile conforming to AAMA 701-92 with polypropylene center fin in remaining locations.
- F. Screens: half screens; held in exterior integral tracks with two stainless steel leaf springs; 5/16" x 1 1/2" x .050" extruded tubular aluminum frame with finish to match window in color and performance; corners mitered, gusset reinforced, and crimped; 18 x 16 dark fiberglass mesh secured with PVC spline.
- G. Sealant: For sealants required within fabricated window units, provide type recommended by the manufacturer for joint size and movement. Sealant shall remain permanently elastic, nonshrinking, and nonmigrating. Comply with Division 7 Section "Joint Sealants" of the specifications for selection and installation of sealants.

### 2.03 FABRICATION

- A. General: Fabricate aluminum window units to comply with indicated standards. Include a complete system for assembly of components and anchorage of window units. Provide units that are reglazable without dismantling sash or ventilator framing.
- B. Frame: Head and sill coped and fastened to jambs with two stainless steel screws per frame corner; corners factory-sealed with sealant conforming to AAMA 800-92.
- C. Water control: One-piece tubular frame sill with separate and offset weep slots for each track; internal foam baffles; exterior weep covers with flaps to allow water to drain by gravity and resist wind-driven water.
- D. Sash: Tubular vertical sash stiles coped and fastened to horizontal sash rails with a telescope-design joint secured with one stainless steel screw per sash corner.
- E. Sash design: Mechanical meeting stile interlock with three contact points - two aluminum and one rigid PVC; sash removed by lifting sash and swinging sash bottom to interior; weep holes for drainage.



- F. Mullions: Provide mullions and cover plates as shown, matching window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections, in the manner indicated.
- G. Glazing Stops: Provide screw-applied or snap-on glazing stops, coordinated with glass selection and glazing systems indicated. Finish glazing stops to match window units.

### 2.04 DOUBLE INSULATING GLASS UNITS

- A. Construction
  - 1. Perimeter sealants: dual - polyisobutylene and silicone.
  - 2. Air space: one continuous aluminum spacer without corner keys; desiccant .
- B. Exterior glass lite
  - 1. Thickness: 1/8".
  - 2. Tint: clear.
  - 3. Type: annealed.
  - 4. Coating: not applicable.
- C. Interior glass lite
  - 1. Thickness: 1/8".
  - 2. Tint: clear.
  - 3. Type: annealed.
  - 4. Coating: not applicable.
- D. Performance
  - 1. Seal durability: conformance to ASTM E 774-88; visible, permanent IGCC certification label for CBA rating level.

### 2.05 OPAQUE INSULATED METAL PANELS

- A. General: Insulated metal composite panels shall be similar and equal to those manufactured by Mapes Industries, Inc., Lincoln, Nebraska. Panels shall consist of a laminated sandwich of polystyrene core with 1/8" water-resistant hardboard substrates and .125" stucco-pattern aluminum skins. The entire sandwich shall be bonded under heat and pressure with top quality, permanently elastic neoprene contact adhesive. Panel thickness shall be one inch.
- B. Exterior face: The exterior aluminum skin shall be finished in genuine porcelain prepared, applied and tested in accordance with the latest recommendations of the Porcelain Enamel Institute, Aluminum Division. Color shall be as selected by Architect from manufacturer's standard colors.
- C. Interior Face: The interior aluminum skin shall consist of a factory-applied finish of either white-baked enamel or random faced.
- D. U-Factor: The U-Factor shall be .206.



## 08000 - Doors & Windows

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### E. Installation:

1. Panels shall be kept dry prior to installation to avoid stains from wet packaging material.
2. Installer shall avoid mechanical fasteners such as nails, screws or bolts through the face of the panel since such fasteners would interfere with the normal thermal expansion and contraction of the panel skin. Panels must be installed according to manufacturer's instructions to assure proper service life.
3. Panels shall be installed in their openings using flexible setting blocks on the bottom edge with expansion space of at least 1/4" provided around the panel perimeter to allow for thermal expansion.
4. Exterior face of panels shall be sealed against water penetration into the opening by means of vinyl weatherstripping built into the window system. Weep holes for proper draining of the frame are required.

- F. Warranty: The manufacturer's warranty of its porcelain on aluminum enamel products shall extend for a period of twenty-five (25) years. This warranty includes the cost of labor for removal or replacement of the product or damages caused in said removal or replacement.

## 2.06 FINISH ON ALUMINUM EXTRUSIONS

### A. Application:

1. On clean extrusions free from serious surface blemishes or scratches; on exposed surfaces visible when the installed product's operating sash are closed.
2. By an approved applicator using a factory-based electrostatic spray and oven bake system.

- B. Quality standard: conforming to AAMA 603.8-92 one-coat paint finish.

- C. Pretreatment: five-stage; zinc chromate conversion coating.

- D. Coating: acrylic; thermosetting.

- E. Coating quantity: one color coat

- F. Dry film thickness: minimum .8 milson exposed surfaces, except inside corners and channels.

- G. Color: chosen from manufacturer's standards.

## 2.07 PROTECTIVE COATINGS

- A. Steel Subframes: Insulate surfaces of steel from direct contact with aluminum surfaces by heavy coat or alkali-resistant bituminous paint or zinc-chromate prime coat, or other coating suitable for this purpose.

- B. Wood Subframes: Properly treat with preservative which will not promote corrosion of aluminum.

- C. Steel or Wood Subframes: Do not leave exposed on exterior of building.

## PART 3 - EXECUTION

### 3.01 DEMOLITION



- A. Hazardous Materials: Prior to performing any demolition, the Contractor shall certify that no hazardous materials are present within the work areas described herein, including but not limited to asbestos, lead based paint, pigeon excreta, and so forth.
- B. Other Instructions From the Contracting Officer: Prior to demolition, the Contractor shall correspond with the Contracting Officer Representatives regarding the temporary or permanent removal and/or storage of materials, features and equipment which the Contracting Officer may elect to retain for their use.
- C. Proper Disposal of Refuse: Unless noted otherwise, all demolished construction, materials, finishes, features, systems and equipment shall become the property of the Contractor upon their removal from the Project site. Proper disposal, re-sale, re-use and/or salvage of demolished construction, materials, finishes, features, systems and equipment shall be solely and entirely the responsibility of the Contractor.
- D. Extent of Demolition: Where existing construction is indicated on drawings or specified herein for demolition, remove it completely. However, all demolition shall be performed selectively, limited to the minimum extent required to accommodate the new work delineated herein and as otherwise required.
- E. Report Discrepancies: The General Contractor shall immediately report to the Contracting Officer any conflicts, errors and discrepancies in the work described herein or other unforeseen conditions discovered during demolition and/or construction.

### 3.02 PREPARATION

- A. Protecting and Patching Adjacent Work: Throughout demolition, protect all adjacent construction, materials, systems, finishes, features and equipment from damage or harm. Patch, repair, restore or replace any adjacent construction, materials, systems, finishes, features and equipment damaged or harmed during demolition. Coordinate with Section 01120.
  - 1. Contractor shall be responsible for damage to grounds, plantings, buildings and any other facilities or property caused by construction operations.
  - 2. Adequately enclose and protect against weather any interior space where installation is incomplete at the end of the working day.
- B. Existing Windows: Remove existing windows; panels below (and above) windows; flashings; exterior and interior trim at head, jambs and sills; precast concrete sills at bottom of masonry openings; and any/all construction debris from site in accordance with Section 01120.
- C. Existing Wood or Metal Framing and Blocking: The Contractor shall inspect all existing wood and/or metal framing and blocking within and around existing masonry openings after demolishing the existing windows and panels, and determine the necessity for replacement due to damage and/or deterioration. If said materials are deemed unacceptable for re-use by the Contractor, with concurrence by the Contracting Officer, the Contractor is to replace the framing/blocking members as required.
- D. Preparation: Prepare openings and existing frames in accordance with ASTM E737.
  - 1. Existing Window Jambs: Prepare as necessary to provide for straight, plumb, level, tight and aesthetically appealing installation of new windows.



## 08000 - Doors & Windows

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2. Preparatory Work: Includes, but is not limited to, repair of jambs, filling holes and/or dents, removing peeling and scaling paint, etc. Comply with Section 01120.
3. Coordinate construction of interior metal stud partitions within existing masonry openings with installation of new interior window stools and all specified or required interior finish materials

### 3.03 INSPECTION

- A. Inspect openings before beginning installation. Verify that rough or masonry openings are within tolerance, plumb, level, clean, provide a solid anchoring surface, and are in accordance with approved shop drawings.
  1. Masonry surfaces shall be visibly dry and free of excess mortar, sand, and other construction debris.
  2. Wood frame walls shall be dry, clean, sound, and well-nailed, free of voids and without offsets at joints. Ensure that nail heads are driven flush with surfaces in the opening and within 3 inches of the opening.
  3. Metal surfaces shall be dry; clean; free of grease, oil, dirt, rust and corrosion, and welding slag; without sharp edges or offsets at joints.
- B. Correct defective openings as required before installation.

### 3.04 INSTALLATION

- A. General: Install windows in accordance with ASTM E737 except as modified by ANSI/ AAMA 101 Appendix, manufacturer's recommendations, Reference Standards, and approved Shop Drawings with skilled craftspeople who have demonstrated a successful history of installing windows for five years.
  1. Securely fasten windows in place to straight, plumb and level condition, without distortion, warp, or rack of frame, window or sash, and make final adjustments for proper operation and satisfactory weatherstrip contact and seal.
  2. Make proper allowance for expansion/contraction movement of aluminum.
  3. Provide thermal isolation where components penetrate or disrupt building insulation. Pack fibrous insulation in shim spaces at assemble perimeter to maintain continuity of thermal barrier.
  4. Panning and Receptor Systems: Install to ensure watertight seal at joints with existing opening and with new replacement window.
    - a. Thermal Insulation: Fill voids in panning system, where specified, with thermal insulation.
  5. Vapor Barrier: Apply vapor barrier on inside between the window frame (or panning) and the existing opening. Seal laps and terminations with pressure sensitive tape.
  6. Comply with applicable codes and regulations regarding egress requirements and firemen entry.
- B. Joint Sealants: Apply in accordance with manufacturer's recommendations. Refer to Section 07900 - Sealants for compounds, fillers, and gaskets to be installed concurrently with window units. Coordinate installation with wall flashings and other components of the work.





## 08000 - Doors & Windows

1. Surfaces to be sealed: Clean, dry and free of any foreign matter that would degrade adhesion. Remove existing caulking and joint sealants from areas to receive new joint sealant.
  2. Prime cleaned surfaces in accordance with sealant manufacturer's recommendations.
  3. Protect surfaces adjacent to joints by masking tape before applying sealant. Remove tape upon finishing sealing work.
  4. Seal joints between perimeter of window frame and underlying or surrounding construction at exterior and interior with joint sealant to accomplish weather-tight installation. Wipe off excess sealant, and leave exposed sealant surfaces clean and smooth.
  5. Maximum Width of Sealed Joint: 13mm (1/2 inch).
- C. Dissimilar Materials: Isolate materials from incompatible materials as necessary to prevent deterioration and galvanic action.
1. Separate dissimilar metals with bituminous paint, suitable sealant, nonabsorbative plastic or elastomeric tape, or gasket between surfaces.
  2. Coat aluminum in direct contact with concrete, masonry, steel, or other non-compatible materials with bituminous paint, zinc chromate primer, or other suitable insulating material.
- D. Remove and legally dispose of existing windows and other materials and construction debris generated from the installation of the new windows.

### 3.05 FIELD TESTING

### 3.06 ADJUSTING AND CLEANING

- A. Adjusting: At completion of job, adjust frames, sash, and hardware after installation, as necessary, to provide a tight fit at contact points and at weatherstripping for smooth operation and a weathertight closure.
- B. Cleaning: Comply with requirements of Section 01120.
1. Clean aluminum surfaces promptly after installation of windows. Exercise care to avoid damage to protective coatings and finishes. Remove excess glazing and sealant compounds, dirt, and other substances. Lubricate hardware and other moving parts.
  2. Scratched or Abraded Surfaces: Touch-up with rust inhibitor primer and enamel paint compatible with factory finish.
  3. Clean glass of pre-glazed units promptly after installation of windows. Comply with the requirements of Section 08810 - Glass and Glazing, for cleaning and maintenance procedures.

### 3.07 PROTECTION

- A. Initiate and maintain protection and other precautions required through the remainder of the construction period to ensure that, except for normal weathering, window units will be free of damage or deterioration at the time of Substantial Completion.

END OF SECTION 08520a



## SECTION 08610

### WOOD WINDOWS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of wood windows, general. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.1 Submittals:
- A. Before proceeding with the manufacture of the windows, prepare and submit complete shop drawings for Contracting Officer approval, and no work shall be performed until the approval of these drawings is obtained. The shop drawings shall indicate the various types of windows and shall also show full size sections of the sash, jamb, head, sill, muntin, meeting rail and all necessary reinforcing.
  - B. Contracting Officer approval of shop drawings shall not relieve Contractor from responsibility for any errors in dimensions which may be contained therein, nor for any departure from the requirements of the contract plans and specifications unless such departures have been fully approved by the Contracting Officer.
  - C. Daylight glass opening dimensions must be indicated on shop drawings for all types of windows.
  - D. When shop drawings have been approved, sash manufacturer shall immediately forward a complete set of such approved drawings to the Contractor.
  - E. Daylight glass openings as actually fabricated in the sash must not vary more than 1/16-inch plus or minus from the daylight opening dimensions indicated on the shop drawings.
  - F. Where the daylight openings as actually fabricated in the sash vary from these dimensions and tolerances noted and, where the glazing for these openings has been manufactured, but cannot be installed due to these dimensional differences, then it shall be the responsibility of the sash manufacturer to procure new glazing (same as specified under Section 08810) for these openings without additional cost to the Contracting Officer.
- 2.0 PRODUCTS:
- Shall comply with performance level 10 in accordance with ASTM F588.
- 2.1 Window:
- A. All wood members of entire window assembly shall be toxic treated with a water repellent preservative, materials and methods to conform with the requirements of the National Woodwork Manufacturers' Association.
  - B. Frames shall be made in accordance with details, with all parts tongue and grooved or ploughed together to make them rigid and tight. They shall be thoroughly braced until frames



## 08000 - Doors & Windows

are built in place. They shall be anchored into walls with bent galvanized steel anchors furnished under Division 5.

- C. Pulley stiles and parting strips shall be of grade "A" N.C. pine; the back linings and inner casings of "C" select grade and all other parts of the frames shall be of No. 1 select grade, either northern white pine (*Pinus Strobus*) or sugar pine (*Pinus Lambertina*), or Idaho white pine (*Pinus Monticola*). Pulley stiles shall be fitted with pockets for access to weights and each weight shall have a 3/8-inch wood pendulum hung from the yoke between the weights.

Note: The Contractor has the option of substituting other woods for the construction of double hung windows in lieu of those above specified. For the optional woods see list below.

- |                   |   |
|-------------------|---|
| 1. Pulley Stiles  | NC Pine (Grade A), or LL Yellow Pine  |
| Parting Strip     | (Clear Select), or Douglas Fir (Clear Heart)<br>or Douglas Fir (rift sawn, Clear Heart).  |
| 2. Outside Casing | White Pine (C Select) or Cypress (Clear   |
| Staff Molding     | Heart), or Cedar (Clear Heart) or Douglas Fir<br>(Clear Heart) or Ponderosa Pine (B and<br>better).   |
| 3. Inside Casing  | White Pine (D Select) or Cypress (No. 1   |
| Back Lining       | common), or Cedar (No. 1 common), or<br>Redwood (No. 1 common), or Ponderosa<br>Pine (D Select), or Douglas Fir (C and<br>better).              |
| 4. Sills (Ext.)   | White Pine (C Select), or Cypress<br>(Clear Heart), or Cedar (Clear Heart), or<br>Redwood (Clear Heart), or Ponderosa Pine<br>(1 and 2 Select). |
| 5. Sash           | Clear White Pine or Redwood (Clear Heart),<br>or Cypress (Clear Heart) with muntins of<br>close grain white Oak.                                |

- D. Set the weather bar specified in Section 05500. Omit weather bar on cellar windows having concrete sills and windows where spandrel panels occur. Completely fill the groove in masonry sill with non-drying caulking compound of composition specified in Section 07920 before the window frame is set.

- E. Sashes

1. All sashes, transoms, etc., required shall be furnished, fitted, set, hung and finished complete, as required. All exterior sash shall be of clear white pine, except the bars and muntins, which shall be of straight, close-grained white oak. The vertical bars shall be framed 1-1/4 inches into the rails and pinned with galvanized steel or bronze pine. Sash shall be fitted in the most accurate manner and shall be double hung, pivoted or hinged, as shown. All joints of sash shall be glued.
2. Omit portion of sash at boiler room window and provide a copper covered framed opening for louver. Frame shall be neatly covered with lead coated copper as specified in Section 07605.



## 08000 - Doors & Windows

- F. Double-hung windows shall be equipped with four (4) completely housed adjustable helical sash balances similar and equal to Unique Balances as manufactured by Unique Balance Company, New York City, or spring and pulley type balance equal to "National Sash Balance" as manufactured by D.J. Dinsmore Co., or Caldwell Mfg. Co. of Rochester, NY. The balances shall be attached to the sashes by means of stainless steel retainer clips and stainless steel F. H wood screws.

### 2.2 Metal Weather Strips:

- A. All exterior double-hung, hinged, pivoted, fixed windows and transom sash shall be equipped with weather strips of zinc cut across the grain.
- B. At double-hung sash the jamb and head strips shall be of 9 gauge. Flat strip at meeting rails shall be of 9 gauge doubled. Hook strip at meeting rails shall be of 12 gauge. Sill strips shall be of 16 gauge. Jamb strips shall be full width of thickness of sash with return flange at jamb parting strip and extended under inside stop and be long enough to prevent sash from running out of strips when the sashes are completely up or down. Head and sill strips shall be folded and have double base. Meeting rail strips shall be interlocking. Jamb, head and sill strips shall be coped at intersections. Jamb strips shall be nailed top and bottom and be readily removable. All other strips shall be secured with nails, 2 inches on centers; those at head and sill being staggered. All shall be so fitted that, when lower sash is raised 6 inches or upper sash dropped 6 inches, there shall not be more than 1/8 inch sidewise movement. If necessary to pack jamb strips in fitting, it shall be done with an approved waterproof material.
- C. At hinged, pivoted, and transom sash the weather stripping shall be of two-piece interlocking type with 12 gauge hook strips and folded with 9 gauge flat strip, all well secured with nails 2 inches apart.
- D. All nails shall be 3/4 inch, No. 16, galvanized or tinned, with needle points and flat heads.
- E. All grooving shall be done by the workman who applies the strips and grooves must not be more than 1/32 inch wider than thickness of folded strip. If groove is cut too large, it shall be lined with 9 gauge zinc at the Contractor's own expense and in a manner approved by the Contracting Officer.
- F. All strips shall be designed to provide for swelling and shrinkage of sashes and all shall be guaranteed against rattling and the passage of air or dust and shall be kept in repair and guaranteed for a period of 5 years.
- G. Weather strips shall match the samples. Samples shall be submitted for approval.

### 2.3 Zinc Weatherstrips: Ribbon Zinc not permitted. Thickness of zinc sheet not less than the following:

- |  |              |
|--|--------------|
| A. Meeting rail hook strips              | 0.028 inches |
| B. Meeting rail tongue strips and blocks | 0.016 inches |
| C. Head Strips                           | 0.028 inches |
| D. Sill Strips                           | 0.046 inches |
| E. Jamb Strips                           | 0.028 inches |

### 2.4 Weather Bars: Brass, bronze or stainless steel.



## 08000 - Doors & Windows

- 2.5 Fasteners: Nails for exterior exposed woodwork hot-dipped galvanized finishing nails. Nails for weather stripping needle point, F.H. tinned steel, #16 x 7/8" long. Screws for weatherstripping F.H. cadmium plated, # 8 x 7/8" long.
- 2.6 Caulking: Caulk all joints between new window frames and masonry. Also caulk all joints between new frames and steel lintels. Remove staff mold to perform caulking and resecure firmly in place when caulking is completed. Materials and workmanship as specified in 08810.
- 2.7 Glazing: Materials and workmanship as specified in Section 08810. Glaze new toilet room sash with obscure glass. Glaze new sash with rough wire glass where the existing sash is so glazed. Glaze all other new sash with clear glass, unless otherwise specified.
- 3.0 EXECUTION:
- 3.1 Inspection:
- A. After delivery of the windows to the site of the work and before installation of same, the Contracting Officer reserves the right to select at random one window of each type required for the project, and remove same for examination and inspection.
  - B. If, after examination and inspection it is found that the window does not comply with the requirements of the specifications, all windows of this same type shall be removed from the site of the work, all costs involved shall be the responsibility of the Contractor.
  - C. If, after examination and inspection it is found that the windows comply with the requirements of the specifications, the windows examined will be paid for or replaced by the Contracting Officer.
- 3.2 Replacing Existing Windows:
- 3.2.1 Preparation of reveals:
- A. Do not remove existing windows until new windows are delivered to the building.
  - B. Cut, alter, repair and/or rebuild existing masonry as necessary to provide recess for new window frames.
  - C. Cut, alter, repair and/or rebuild masonry sills as necessary to provide recess for weather bars and provide full bearing for wood sills.
  - D. Expose existing lintels.
  - E. Provide rabbet in weather stop for extension plates.
  - F. Cut, remove and/or rebuild masonry jambs as necessary to provide solid masonry for the attachment of window strap anchors.
  - G. Cut recesses before removing existing windows wherever possible.
  - H. Cut edges of caulking recesses straight and plumb.
- 3.3 Patching:
- A. Patch, extend and restore existing work and finishes damaged as a result of the specified operations and leave such work in a sound finished condition equal to corresponding existing work.



## 08000 - Doors & Windows

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- B. Build in all work which comes in contact with new masonry.
  - C. Patch, point, parge window frame recesses as necessary to finish plumb and square.
  - D. Do not parge masonry surfaces which are in contact with caulking compound.
- 3.4 Setting Frames: Set frames plumb, square and true with full bearing on masonry sills with proper recess for calking. Set sills and weather bars in plastic cement. Secure frames to recesses with 16 gauge galvanized bent steel strap anchors not less than 2 inches wide. Locate anchors at 3 ft. intervals along jambs and over each jamb and mullion. Bottom jamb anchor not more than 12 inches above sill. Not less than 4 anchors at each jamb in addition to anchors over jambs and mullions. Secure anchors to masonry behind back lining with 5/16 inch brass bolts and cinch anchor sleeves or approved ram set fasteners. Bolts and ram set fasteners not less than 2" long with 1" heavy gage washers. Cinch anchors shall be double sleeve type. Secure to overhead lintels with 1/4 inch tap bolts. Secure end of each anchor to inner casing with 2 - # 12 - 1 1/4 inch wood screws. Locate head blocking masonry mortar. Install anchors such that they are entirely concealed behind the trim or plaster. Set frames to provide uniform 1/4 inch wide caulking recess full length of jambs and head.
- 3.5 Sash: New sash shall have same number of lights as existing similar sash. Mortise and tenon stiles, rails and muntins. Tenon width not less than 3/4 width of parent member. Assemble all joints exposed to weather with white lead paste. Draw joints up tight, clamp securely and pin through tenons. Fit, balance and hang sash so that they work free and easy with not more than 1/16 inch clearance between sash and frames. Block toilet room sash as shown on details. Plow and bore stiles for sash chains and sash chain anchor attachments.
- 3.6 Trim: New trim shall be a practical match of existing corresponding trim on adjoining windows. Provide exterior casings and drip caps where this trim occurs on existing removed windows. Fit window trim neat, accurate and free from open joints, tool marks or other defacements. Drill holes for nails and other fasteners where necessary to avoid splitting. Secure trim firmly in place with staff beads loosely applied until frames are caulked, then nail securely in place with 8 penny galvanized finish nails. Install all required grounds and blocking. Do not splice casings, stools, aprons, caps, sills or similar members.
- 3.7 Trim Option: Existing window trim which is sound, true, of proper dimensions, free from cutouts, splits, splices and other defects prohibited in new trim may be reused provided it can be fitted equal to new trim. Sand exposed surfaces of reused trim smooth. Existing interior trim having window cleaning anchor holes, nail holes, screw holes and small surface imperfections, may be reused, provided the defects are of such a nature that they can be repaired in a manner that makes them unnoticeable in the finished work. Fill in all such defects solid with plastic wood properly keyed in place and sanded smooth.
- 3.8 Preservative Treatment:
- A. All new wood window frames, sash and exterior trim shall be preservative treated.
  - B. New interior trim shall not be treated. Treatment as specified for new windows.
  - C. All treated parts of windows shall be prime painted in the field after treatment has been inspected and approved by the Contracting Officer.
- 3.9 Window Cleaning Equipment:



## 08000 - Doors & Windows

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- A. Anchors: Window frames of all double-hung windows shall be fitted with window cleaning anchors (where required on the exterior and interior faces) in accordance with the requirements of the Corpus Christi Army Depot .
- B. Holes for the anchor bolts shall be bored and counter bored by the manufacturer of the window frames and shall be located as required by the Corpus Christi Army Depot . Bolts shall be exposed on the exterior and interior face of window strip as indicated. The bolt threads shall be peened on the interior end and then covered with an ornamental cup. Peening of bolt threads shall not be done until after the weather stripping of windows has been completed.

Anchors and bolts shall be bolted and screwed to the window frame after the frames have been set in place. The screws shall be No. 12 round headed brass, wood screws, 1-1/2 inches long.

- C. Anchors and bolts shall be forged or machined of corrosion resistant alloy as required by Corpus Christi Army Depot . The Contractor shall submit for approval samples of anchors and bolts, together with a line drawing and an affidavit from the manufacturer stating that the design and material of the anchors and bolts will be an exact duplicate of the anchors approved. All exposed parts of the anchors shall be finished smooth and buffed.

3.10 Painting: - Section 09900

3.11 Insect Screens: Similar to screen specified in Section 08520.

END OF SECTION 08610



## SECTION 08710

### FINISH HARDWARE

- 1.0 DESCRIPTION OF WORK: Furnish all finish hardware as required for a complete installation including scheduling, packing, handling and delivering of hardware to the building as required by the Contracting Officer, and as specified herein. Demolition and removal of materials shall be as required to support work.
- 1.2 SUBMITTALS
- 1.2.1 Manufacturer's Technical Product Data: submit for each hardware item, with instructions for installation, operation, and maintenance.
- 1.2.2 Samples: one for each type of hardware; submit with Hardware Schedule. Approved samples may be installed in the Work. Hardware installed shall correspond in all particulars to the approved sample of the respective type.
- 1.2.3 Hardware Schedule: Correspond Hardware Set number designations with that specified herein; indicate the following for each item of hardware:
- a. Locations of hardware.
  - b. Name, manufacturer, type, style, size, function, and finish.
  - c. Information for fastenings.
  - d. Mounting Locations.
  - e. Frame and Door materials and sizes.
  - f. Explanation of abbreviations and symbols.
- 1.2.4 Templates: At time of submittal of Hardware Schedule, furnish hardware templates to fabricators of other work to be factory-prepared for the installation of hardware.
- 1.2.5 Key Schedule
- a. A copy of the Hardware Key Schedule, prepared by the hardware supply Sub-contractor, shall be forwarded to the Contracting Officer.
  - b. Stamp top face of each key with a letter and number starting with A1 to Z1 and continuing the series of letters and numbers to the maximum number of keys furnished. Tag each series of keys.
  - c. Stamp face of each cylinder with the same corresponding letters and numbers.
  - d. All locks shall be made up on combinations as specified.





- e. Furnish a schedule of keys in quadruple giving the letter and number of each key and the number of the rooms, cases, lockers, and all other locations for which the keys are intended. Submit schedule for approval before making keys.

### 1.3 QUALITY ASSURANCE

- 1.3.1 Hardware Supplier: reputable, 3-year minimum experience, with experienced hardware consultant on staff.
- 1.3.2 Manufacturer: Obtain each hardware type from a single manufacturer.
- 1.3.3 Minimum Quality Requirements: Hardware items shall be of quality specified herein, and shall meet or exceed the requirements of ANSI A156 series standards.
- 1.3.4 Fire-rated Openings: Provide hardware in compliance with NFPA Standard No. 80; tested and listed by UL for types and sizes of doors, and in compliance with requirements of the door frame and door labels.

### 1.4 SHIPPING, STORAGE, AND HANDLING

- 1.4.1 Package and ship hardware in manner to prevent damage. Properly identify and tag each item. Sort and package hardware and mark with appropriate set numbers.
- 1.4.2 Inventory hardware immediately upon delivery.
- 1.4.3 Provide secure storage area for hardware until installed.

## 2.0 PRODUCTS

### 2.1 MANUFACTURERS

#### 2.1.1 Butts

Stanley  
McKinney  
Hager  
Lawrence

#### 2.1.2 Locksets, Passage Sets (Knob Type)

Sargent  
Russwin

#### 2.1.3 Locksets, Passage Sets (Lever Type)

Marks

#### 2.1.4 Rim Latch

Yale

#### 2.1.5 Cylinders

Sargent



## 08000 - Doors & Windows

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Russwin

### 2.1.6 Exit Devices

Von Duprin

### 2.1.7 Pulls

Brookline

### 2.1.8 Door Closers

LCN

### 2.1.9 Overhead Stop and Holder

Glynn Johnson

### 2.1.10 Surface Bolts

Ives

### 2.1.11 Security Bolts

Lori Corp.

### 2.1.12 Wall Bumpers, Floor Stops

Ives

### 2.1.13 Sliding Door Hardware

Grant

Stanley

### 2.1.14 Cylinders for Lockers, Drawers, and Book cabinets

Sargent

Russwin

### 2.1.15 Cabinet Hardware

A. Drawer Pulls

Ives

Stanley

B. Hinges

Ives

Stanley

C. Shelf Standards and Supports

Knape & Vogt

## 2.2 MATERIALS AND FABRICATION



### 2.2.1 General

- a. All hardware heavy duty cast or forged (.080 min.) bronze with satin chromium finish US26D, except as otherwise specified.
- b. Interior Door Holders: steel, satin chromium US26D finish.
- c. Door closers and brackets shall be as specified herein and painted with an aluminum finish.
- d. Interior butts and horizontal releases shall be as hereinafter specified with chrome finish.
- e. Surfaces of all castings shall be true, smooth and free from burrs, and all portions of lock mechanism and accessory components which come in contact with or bear upon other parts shall be dressed to a true, smooth surface.
- f. Members that are specified to be japanned shall be heavily coated with best quality of No. 1 lock japan, mixed in the proportion of 4 gallons of japan to 1/4 gallon of turpentine, applied with a brush in two heavy coats and baked at a high temperature.
- g. All items of cast iron shall be annealed.
- h. Whenever the weight of any piece is specified it shall mean actual weight of casting without screws, washers and other accessories.
- i. Do not use products with manufacturer's name in an exposed location, except name will be permitted on rim of lock cylinders only.

### 2.2.2 Screws

- a. Secure all hardware with suitable screws and bolts of same material and finish as hardware items. Screws for strike and face plates, hinges, sash fasts, transom hardware, window pole plate, half-mortise brass locks, japanned pulls and hat hooks, overhead door holders, and all door checks and brackets for these items shall be flat-headed counter-sunk screws. Screws for all other exposed hardware: oval-headed; all shall be countersunk, unless distinctly specified otherwise. Screws for butts for exterior aluminum doors: stainless steel. Screws for all other entrance door butts, closers, and holders: machine screws.
- b. Hardware for metal frames and doors shall be secured with suitable tap-screws, mill screws and bolts.
- c. All wood screws for securing door butts shall be at least two inches long to secure butts through jamb and into wood stud behind jamb and blocking.

2.2.3 Hubs for knob spindles: bronze metal finishing flush on each side of case. Bearings shall be true and even.

### 2.2.4 Finishes: Hardware finishes are as follows:

- a. US3 - Polished Brass, Clear Coated;
- b. US4 - Dull Brass, Clear Coated;
- c. US9 - Polished Bronze, Clear Coated;
- d. US10 - Dull Bronze, Clear Coated;



## 08000 - Doors & Windows

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- e. US10B - Oxidized Dull Bronze, Oil Rubbed;
- f. US19 - Flat Black;
- g. US26 - Chrome Plated Brass Or Bronze;
- h. US26D - Dull Chrome Plated Brass Or Bronze;
- i. US32 - Polished Stainless Steel;
- j. US32D - Satin Stainless Steel;
- k. SBL - Aluminum Painted;
- l. LBL - Dark Bronze Painted;
- m. DBL - Light Bronze Painted.

### 2.3 GENERAL HARDWARE REQUIREMENTS

- 2.3.1 Hardware Schedule is intended as a guide and it shall not relieve the Contractor from the necessity of furnishing everything which may be necessary to complete the hardware requirements.
- 2.3.2 All hardware to be used on hollow metal doors, transoms, sash or jambs, shall be made to templates and be packed with machine screws.
- 2.3.3 Hardware items which are not described shall be equal in grade and workmanship and in all other particulars to similar items of hardware which are described.

### 2.4 HARDWARE TYPE REQUIREMENTS

Note: The number designations e.g. (615), listed herein for hardware items are arbitrary designations determined by the Contracting Officer for convenience of identification; and have no reference to any standard, association, or manufacturer's designation.

#### A. Locks and Latches

- 1. Mortise Pin Tumbler Stop Latch for Main Entrance Doors.
  - a. Case: not less than 3 1/2" x 4 1/4" and not more than 1 1/8" thick.
  - b. Latch Bolt: not less than 3/4" x 1", full-throw, anti-picking, easy spring type, constructed to operate by a slight pressure on the horizontal release, regardless of the amount of pressure against the door.
  - c. Cylinder Backset: not less than 2 1/2".
  - d. Face Plate: not less than 1 1/4" x 7" x 3/16" solid thickness, or heavily reinforced by ribs and bridging at the back, or steel-plate 1/8" thick armored with bronze face plate not less than 3/32" thick.
  - e. Strike Plate: cast or forged bronze, not less than 4 1/4" x 1/8" by full width of face plate.
  - f. Strike: Box type.
  - g. Latch Protector: cast bronze.



- h. Latch Operation: with horizontal release inside and by key outside; latch capable of being locked back with key.
- 2. Mortise Stop Latch for Entrance Doors
  - a. Case: not less than 4" x 3" and not more than 1" thick, secured indoor.
  - b. Latch Bolt: not less than 7/8" x 1/2", full 1/2" throw, anti-picking easy spring type, constructed to operate by a slight pressure on the horizontal release, regardless of the amount of pressure against the door.
  - c. Cylinder Backset: not less than 2 1/2".
  - d. Face Plate: not less than 1" x 5-1/2" x 1/8", secured with 2 screws.
  - e. Strike Plate: cast or forged bronze, not less than 5" x 3/32" by full width of face plate.
  - f. Strike: Box Type.
  - g. Latch Protector: Cast bronze or forged, on exterior face of doors.
  - h. Latch Operation: horizontal release inside and lock can be locked back with a key from inside; latch capable of being locked back.
- 3. Exit Devices

Provide exit devices with the following features:

  - a. Nonhanded, touch bar type.
  - b. Full reversible mortise lock.
  - c. Field sizable.
  - d. 3/4" throw, anti-friction latch bolt.
  - e. Latch bolt deadlocking.
  - f. ANSI Function: 08.
  - g. U.L. Label as indicated on the Drawings.
  - h. Standard accessories.
- 4. Storerooms, Closets and Janitor's Sink Closets

Japanned or electro-bronze plated case not less than 2-3/8" x 3-1/2" with a heavy strike to suit conditions at jamb. Latch bolts not less than 1" x 1/2", full 1/2" throw.
- 5. Cylinder Lockset for Rooms, Offices, and at other locations as indicated.
  - a. Type: mortise, easy spring cylinder lock with latch bolt and guard bolt.
  - b. Case: 5-5/8" high, 4" wide, 3/4" thick.
  - c. Backset: 2-3/4"
  - d. Hub: bronze for 3/8" swivel spindle.
  - e. Front: 8" high x 1-1/4" wide, adjustable, protected, attached to case by machine screws.



## 08000 - Doors & Windows

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- f. Knobs: Unless distinctly otherwise specified: heavy cast bronze, 2-1/4" diameter, plain pattern, secured to full 5/16" steel spindles by a concealed method.
  - g. Rose and Escutcheon: combined, each side, 2-1/2" x 8", perforated for cylinder on outside only; working parts of cast or forged brass.
  - h. Operation: From inside at all times by knob. Key on outside cylinder permits operation of outside knob, or makes outside knob stationary, as desired. Guard bolt, working on closed strike plate, automatically locks regular latch bolt to prevent its being forced back when door is closed.
  - i. Secure locksets to doors with Phillips Head screws.
- 6. Lever-type Cylinder Lockset for Rooms, Offices, and at other Locations as indicated.  
Provide Locksets identical to (621), except: provide approved lever handles in place of knobs; provide approved two-piece spindles.  
Operation: Same as (621).
- 7. Cylinder Lockset for Special Toilets, Rest Rooms, and at other locations indicated.
  - a. Identical to lock set No. (621A) except operation as follows: Latch bolt shall be operated by knob at all times from inside, and by key only from outside. Outside knob to be on a swivel spindle set in a fixed hub in lock.
- 8. Lever-type Cylinder Lockset for Special Toilet and other locations indicated.
  - a. Identical to Lockset (621A) except operation as follows: Latch bolt operable by lever at all times from inside, and by key only from outside.
- 9. Knob Latch for locations indicated.
  - a. Identical to Lockset No. (621) except it shall have the following operation: Latch bolt shall be operated by knob at all times from inside, and by key only from outside. Outside knob to be on a swivel spindle set in a fixed hub in lock.
- 10. Lever-type Cylinder Lockset for Toilet and at other locations indicated.  
Identical to Lockset (621A) except operation as follows: Latch bolt operable by lever from both sides at all times.
- 11. Pin Tumbler Cylinder Lock for Drawers in Lockers, Tables, Book Cabinets, Bookcases, Supply Cabinets, and at other locations indicated.  
All bronze.
- 12. Pin Tumbler Cylinder Lock for Lockers, Book Cabinets, Bookcases, Supply Cabinets, and at other locations indicated.  
Cast bronze locker lock, size 2" x 1-5/8", with a bolt 3/16" x 7/8", with not less than 1" throw. Lock for Sliding Doors shall be equal to Corbin 02291X.
- 13. Cylinders  
Cylinders of locks shall be of proper length to fit the doors for drawers for which they are intended. Cylinders for all locks shall be cast bronze using a common standard diameter cast bronze rotating plug. The keyway shall be a paracentric type of single section with



seven pins or multiple (four or more) sections with six pins capable of being masterkeyed and grand masterkeyed as directed by the Contracting Officer without duplications or interchanges.

### 14. Strikes

Strikes for latches shall project sufficiently to properly protect trim. Slots in strike plates shall not be more than 1/4" longer than bolts, and not less than 1/4" metal will be allowed between slots for latch and bolt.

Strike plates to be used with hollow metal jambs shall be of box type with closed back.

### 15. Latch Bolts

Latch bolts shall be constructed so that they can in no way work loose, and if washer is riveted to latch spindle, the rivet head shall be full and machine upset. All latch and lock bolts not otherwise specified shall be cast bronze.

## B. Bolts and Catches

### 1. Extension Bolt for Large Double Interior Doors.

Face Plate: Cast bronze, not less than 1" x 6-3/4" x 1/8", recessed, with large thumb piece secured with 4 screws. For wood doors, set face plate flush. For hollow metal doors, set face plate on surface; edges rounded or beveled.

Bolt: 1/2" square, full 3/4" throw; bolt carriage smoothly fitted with strong guide posts and heavy spring.

Guide Plates: heavily flanged

Strike: For composition or concrete floor: 3" deep with flange of not less than 1/4" at top and well-grouted in position. For wood floor: flanged back full 1/2" and secured with 2 screws.

### 2. Surface Bolts for Double Doors Over 3'-0" in height to Supply Cabinets, Cases, and other locations indicated.

Surface bolts shall be Ives No. 43, 6" long.

### 3. Sash Locks for Double-Hung Windows (wood).

Cast bronze of the pole operated signal type.

### 4. Bullet Catch

3/8" x 7/8" bronze shell, oval friction head on steel pin with bronze spring; adjustable. Bronze strike plate on door. Shell to be inserted in jamb.

### 5. Elbow Catch on Doors Under 3'-0" in Height

Cast bronze elbow catch with spring on plate not less than 2-1/2" x 1"; strike plate not less than 1-1/2" x 1/2"; six screws. Weight without screws approximately 2-1/2 ounces.

## C. Door Pulls

### 1. Main Entrance Doors



## 08000 - Doors & Windows

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Heavy pattern, cast bronze store door handle and plate. Handle secured to plate by through bolts. Plate shall be not less than 3" x 15", raised 1/4" with recessed back, beveled or rounded edges, having four lugs on back to receive bolts from escutcheon plate on opposite side of door. Lock cylinders shall be fitted through plate. Plate and handle, without cylinder or screws, shall weigh not less than 2 pounds 10 ounces and shall be secured by 6 screws.

### 2. Entrance Doors

Heavy pattern-cast bronze pull bolted to heavy cast-bronze plate with beveled or rounded edges, having four lugs cast on back to receive bolts from escutcheon plate on opposite side of door. Weight of handle and plate not less than 20 ounces.

### 3. Vestibule, Auditorium Doors and Other Interior Doors.

Standard, pattern cast-bronze pulls Brookline 750 A.T.; Corbin No. 02210 1/4. Pulls shall have lugs on underside to receive heavy machine screws running through door. Where screws are exposed on back of door, they shall be of brass, with countersunk brass washers not less than 1/2" diameter. Where heads of screws are concealed by push plates and other hardware items, they shall be round-headed steel machine screws and flat washers, let into door sufficiently to clear head.

NOTE: Where two pulls are specified for a door, the pull used on the closet, space or room side of door shall be the same type of pull except they shall be secured to door with three screws; pulls shall be Brookline 750A.

For small access doors to pipe spaces provide flush finger pulls, Brookline 780.

### 4. Door to Lockers, Bookcases, Supply Closets and Wardrobes.

Solid standard pattern cast-bronze pull with clear finger space 3-1/2" x 7/8". Weight not less than 3-1/2 ounces. Secure with 4 screws.

### 5. (658) Small Doors

Small wrought-bronze round knob, not less than 1" in diameter: P.&F. Corbin No. 153 1/2.

## D. Drawer Pulls

Approved cast pattern, secured by two concealed screws. Clear finger space not less than 11/16" x 2-5/8", and 4-1/8" over all. Weight not less than 2 ounces. Where not otherwise definitely specified, provide two pulls for all drawers 20" wide or over and one pull for each drawer less than 20" wide.

## E. Door Holder

### 1. Heavy Door Stop and Holder

Holder shall be a combined door stop and holder provided with an attachment for releasing the holding device so that the apparatus can be used either as a door stop and holder or as a door stop. The holder must be of sufficient length to extend more than one-half the width of the door measured from the hinge side. Secure holders to jamb head with four No. 14, 2-1/2" wood screws or four No. 14-20 hardened steel machine screws; secure bracket on door with four 1/4" through-bolts with heads concealed with buttons or caps except on hollow metal doors, where the brackets shall be secured with tap screws.





Stops and holders for all exterior doors shall be bronze. Finish door stops and holders for interior doors to match the door hardware. Holder specified above shall be equal to G.J. 80MHD series.

2. Light Overhead Door Stop and Holder. (For Interior Doors)

Holders shall be of an approved type of such length and design that the door end of the holder can be secured to the door at a point more than one-half the width of the door away from the edge of the hinge stile. Secure holders to jamb head with four 1/4" wood screws 3" long and to the door with two 1/4" carriage bolts with the nuts concealed by bronze buttons or caps. Construct holders to automatically hold the door open at approximately 90 degrees, and release when door is sharply pulled to close it. Fit holders with an approved type of shock absorber to relieve the strain on the door butts. Holders shall be bronze plated. Holder specified above shall be equal to G.J. 83M Series.

3. Door Holders and Door Stops

All doors swinging in an arc of not more than 100 degrees against flat wall surfaces or against a cabinet or similar installation, unless otherwise specified, shall be provided with GJF 40 stop for wood doors and GJFB13XS stop for hollow metal doors and FPSC wood doors; all other doors unless otherwise specified shall be provided with GJ 83M Series holder; omit holder feature on hollow metal doors.

4. Door Stops for Hollow Metal Doors

All hollow metal doors throughout the building shall be provided with stop to suit condition except where another type stop is specially indicated. Where hollow metal doors open against projecting columns or pipes in rooms, Closets, and other spaces, and where door closer or other projecting hardware could damage the wall finish, provide and overhead stops similar to GJ 83M Series (675B) without holder feature.

5. Door Holders (Double Doors)

Where door holders are specified for double doors for Supply Closets in Corridors and built-in Closets in Rooms, holders shall be provided for one door only, unless otherwise specified.

F. Door Closers

1. Door Closers

All door closers shall have cast iron or aluminum cases specially treated to overcome porosity, shall have arms of malleable iron and connecting rods of high carbon steel. When brackets are required for door closers, they shall be of malleable iron.

2. All door closers shall be of the rack and pinion type of liquid, spring door closers of approved manufacture. All door closers shall be guaranteed to properly operate the door and to be free from any mechanical defects for a period of two calendar years from the date of the final acceptance of the work of this Contract. All closers that fail to meet these requirements must be replaced or repaired and made to operate properly. All closers shall be equipped with clock key valve.

3. Door closers shall be of the size shown in the following schedule except where otherwise called for:



## 08000 - Doors & Windows

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- |    |  |       |
|----|--|-------|
| a. | For interior doors up to and including 32" wide  | No. 2 |
| b. | For all other interior doors, except vestibule   | No. 3 |
| c. | For outside and vestibule doors  | No. 4 |
| d. | For soundproof doors   | No. 4 |
| e. | For handicapped children (for interior doors up to and including 34" wide) (5 lb pressure with 4-6 second delay) | No. 2 |
4. Double doors shall have one closer to each pair of doors, unless otherwise specified. Place closers on outside doors on brackets. Closers on wood doors shall be through-bolted with six bolts.
5. All closers shall be equipped with valve control back check for opening.
6. Closer shall be provided on all hollow metal doors.
7. Provide no closers on Hollow Metal access doors.
8. Closers on doors in entrance hall or lobby shall be placed on room side of doors.

### G. Butts and Hinges

1. Extra Heavy Wrought Bronze Butts
- a. Ball bearing, self-lubricating butts, with inner edges of leaves beveled, three to each door. Fast pin, for outside doors; loose pin for inside doors. Fast pin butts shall have stainless steel pins, stainless steel set screw in barrel, stainless steel balls and raceways. 6" x 5" butts shall be 0.203 gage, 5" x 5" butts shall be 0.190 gage. The 6" x 5" butts shall have 8 or 10 screws per butt and 5" x 5" butts 8 screws per butt. All butts shall have flat button tips and shall have the classification number and the trade name or trade mark of the manufacturer stamped on tips.
- b. Fast Pin Butts
- Fast Pin Wrought Bronze Butts in sizes 3" x 2-1/2" and 3" x 3", 0.092 gage. Each hinge shall have 6 screws. Doors 5'-0" or over in height shall have 3 butts to each door.
2. Wrought Bronze Butts (Interior Doors)
- a. All interior doors, unless otherwise specified, shall have wrought bronze butts, five knuckle, ball or oilite bearing full mortise type.
- b. Butts shall be made of cold rolled bronze with the inner edges of the leaves beveled to make close fitting joints, the outer edges shall be true, all corners square, and all surfaces finely finished and highly polished.
- c. Pins shall be made of cold drawn stainless steel wire, and shall be grooved to hold the lubricant.
- d. Balls and raceways shall be stainless steel.
- e. The tips shall be bronze of the flat button type, with shoulders flush with the barrels.
- f. All butts shall have the classification number and the trade name or trade mark of the manufacturer stamped on tips.



## 08000 - Doors & Windows

- g. Where wrought bronze butts No. (715) are specified in the Hardware Schedule, the Contracting Officer may substitute ball or oilite bearing, flat button tip, wrought steel butts.
- h. The size of wrought steel or bronze butts shall be furnished in accordance with the following schedule:

DOOR SIZE	BRONZE NO	STEEL NO	BUTT SIZE
Sound Proof Doors	Stanley FBB199 McKinney T4B3386	Stanley FBB168 McKinney T4B3786	6" x 5" 6" x 5"
1-3/4" Over 37"H.M.	Stanley FBB199 McKinney TB3386	Stanley FBB168 McKinney TB3786	5" x 4-1/2" 5" x 4-1/2"
1-3/4" to 37"H.M.	Stanley FBB191 (ANSI A2112) McKinney TB2314	Stanley FBB179 McKinney TB2714	4-1/2"x4-1/2" 4-1/2"x4-1/2"
Egress Stair Doors Entrance Vestibule Doors (Omit if flush transom panel above). Substitute extra heavy 5" x 4 1/2" butts	(NONE)	Stanley FBB212 McKinney TA792  (corner reinforcing butts)	5" x 4-1/2" 5" x 4-1/2"
1-3/4" to 40" W.D.	Stanley FBB191 (ANSI A-2112) McKinney TB2314	Stanley FBB179 McKinney TB2714	4-1/2"x4-1/2" 4-1/2"x4-1/2"
Wire Mesh Doors H.M. Access Doors	Stanley BB191 McKinney TB2314	Stanley BB179 McKinney TB2714	4" x 4" 4" x 4"

- i. Each butt shall have two permanently attached ball or oilite bearing washers, enclosed in a solid bronze casing, consisting of hardened steel raceways containing hardened tool steel balls.
- j. All wood doors and hollow metal steel doors shall be provided with full mortise loose-pin butts except the doors to closets, store-rooms and supply rooms that open out, which shall be fast-pin butts. Fast-pin butts shall have pins fastened to the knuckle by a set screw so placed that it will not be accessible when the door is closed.

### 3. Spring Butts

Two (2) single acting 4" Chicago Triplex BU 2002 Spring Butts, button tips.

### H. Padlocks



## 08000 - Doors & Windows

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### 1. Type "C" Padlocks

Padlock case shall be of 1-3/4" extruded brass, cornered elliptical shape. The ridge of the case shall be 1-3/4", the depth 1-19/32" and the thickness 13/16". The shackle shall be of hardened steel cadmium plated with a diameter of 11/32". The width of the opening of shackle from the top of the case to the inside of the shackle shall be 29/32". The shackle shall lock at both the toe and the heel.

### 2. Type "D" Padlocks

Padlock case shall be of 1-1/2" extruded brass, cornered elliptical shape. The width of the case shall be 1-1/2", the depth 1 1/4" and the thickness 21/32". The shackle shall be of hardened steel cadmium plated with a diameter of 1/4". The width of the opening of shackle from the top of the case to the inside of the shackle shall be 5/8". The shackle shall lock at both the toe and the heel.

### 3. Both Type "C" and "D" padlocks shall have cylinders capable of being keyed individually, keyed alike, masterkeyed in sets and grandmasterkeyed, as directed by the Contracting Officer.

### 4. All padlocks shall have 14 gage steel wire chains 9" long attached to lock and riveting pins with rivets and clevis in an approved manner. Chains, rivets, clevis and riveting pins shall be hot dip galvanized or cadmium plated. Chains shall be galvanized after fabrication.

### 5. Furnish, as required, Type "D" padlocks No. (746) for all outside gates, and at other locations required. Locks to be set up alike; furnish five (5) keys for all.

### 6. Furnish, as required, Type "D" padlocks, No. (747), for outside and inside window guards in Stair Enclosures and Corridors above street level and at hinged fresh air intakes, and at other locations indicated. Locks shall be set up alike; furnish five (5) keys for all. Provide no padlocks on all outside and inside wire mesh window guards (except those that occur in the Stair Enclosures, at roofs and in Corridors).

### 7. Stamp or cast the manufacturer's name and the words, "Property of the Corpus Christi Army Depot" on all padlocks.

## 2.5 MISCELLANEOUS HARDWARE

### A. Card Holder

Heavy cast-bronze, to receive a 3" x 1-1/2" card. Secure with 4 counter-sunk screws. Place holder on the stile of the door above the door knob with bottom of holder 5 feet above the floor.

### B. Kick Plates (Plastic and Stainless Steel)

#### 1. Kick plates shall be the full width of doors between stops 8" in height, secured with flush countersunk screws. Double swing doors shall have plates on both sides, single swing doors unless otherwise specified, shall have plates only on the side opposite the pull.

#### 2. Plastic kick plates fabricated of laminated thermosetting resin plastic of type tested and approved by the National Bureau of Standards and conforming to Federal Specification FF-H-111a Type 1227 for "Hardware, Builders, Shelf and Miscellaneous". Plastic plate 1/8" thick, black color with satin matte finish both sides, edges beveled, holes (maximum of 8"



## 08000 - Doors & Windows

centers) drilled and countersunk for No. 6 oval head screws. Height and width as specified.

3. Stainless steel kick plates, Ives 8400.532D, 16" high, 0.050" thick, all edges beveled, secured with oval head countersunk stainless steel screws approximately 4" apart.

C. Bronze Kick Plates

Polished bronze, 16 gage, 16" high and full width of door between stops, secured with oval head countersunk brass screws approximately 4" apart. Bevel or neatly round exposed edges of plate.

D. Push Plates

Stainless steel plates Brookline style 53, full 1/16" thick with beveled edges four sides and secured by six (6) stainless steel screws. When used as an escutcheon, plate shall be pierced on center line, to suit lock with which it is used.

E. Stop Adjusters

Countersunk bronze Ives Window Stop Adjuster No. 6,

F-14 (bright nickel) 5/8" diameter, with 1-1/4" No. 8 round head screw slotted adjusters, manufacturer's stock finish, ribbed or lugged to prevent turning and secured with a No. 8 round head bronze wood screw 1 1/4" long.

F. Coat and Hat Hooks

1. Ives No. 571 MB (cast brass or bronze) 26D ANSI A156.16, Fed. Spec. 1172. For lockers, backs of doors of Executive Toilets and Medical Toilets, and at other locations indicated; two No. 10 screws shall be furnished for each hook.
2. Provide hat hooks for lockers, for hook strips, shelf and hook strips and elsewhere required or specified herein.

G. Progressive Slides

Drawers, progressive slides (each drawer): Garco No. 363.

H. Door Stops for Door to Toilet Rooms, Locker Rooms and Stair Doors

Cast-bronze flange and rubber socket bumper with rubber 1-inch in diameter secured with pin. Flange secured with 3 bronze screws to wood block. Weight: 8 ounces. Projection: 3". Ives No. 447 cast bronze, B26D, Fed. Spec. 1320.

I. Cabinet Shelf Rests

Rests shall be of gray-plate metal supported by gray plate metal pilaster strips. Four rests for each shelf. Provide for adjustable wood and metal shelves in all cases and cabinets.

J. Supports for Glass Shelves and Free Standing Adjustable Shelving on Plaster Walls

K & V 233SS Standards, Type 304 stainless steel.

K & V 256SS Supports Type 304 stainless steel.



## 08000 - Doors & Windows

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Approved chromium-plated pilaster strips, secured with 7/8" wood screws, 12" on center, with adjustable chromium plated bracket shelf supports. The bracket support shall have chromium plated brass tees secured to top of brackets. See Drawing Details. Adjustable shelving on pegboard shall be provided as part of the work of Section 06220.

General Locations:

Glass shelving -- Display Cabinets, Cases, Other Cabinets. Open Wood Shelving on Pilaster Walls -- Rooms of Instruction.

K. Letter Box Plate

Cast-bronze letter box plate, Sargent's Catalog No. 268 for doors.

L. Card Holders (Special)

Where specified a cast-bronze card holder may be affixed to specific doors. Card holders shall be large enough to hold a 2" x 6" card.

M. Screw Hooks for Tools and Umbrellas

Provide and deliver to the Contracting Officer's Representative three gross of screw hooks, Sargent's Catalog No. 908 for tool boards in specified workshops.

### 2.6 WINDOW-POLE FIXTURES

A. Pole Hook

Heavy cast-bronze, standard pattern, ferrule 1-7/8" deep inside of socket. Weight not less than 4 1/2 ounces. Two screws.

B. Sash Plate (Wood Windows)

Special sash plate of malleable iron or steel made as per detail and sherardized.

C. Pole Hanger

Solid cast-bronze slotted plate, 2-3/8" x 1-3/16", raised 7/16", recessed back, round ends. Weight: not less than 1 1/4 ounces. Secure with two heavy 1 1/4" screws.

### 2.7 DOORS IN TABLES, CASES, CABINETS

A. General

1. All hardware required for door to display cases and display cabinets in corridors will be furnished with the cases and cabinets.
2. All hardware required for wardrobes will be furnished with the wardrobes except hardware for door to material and storage cabinets.
3. Butts for cabinet doors 1-3/8" thick: 3" x 3" fast pin; for cabinet doors 1-1/8" thick: 3" x 2-1/2" fast pin; for small doors under counter shelves in cupboards: 2-1/2" x 2-1/2" butts. For doors 13/16" thick: 2" x 2" butts.

B. Doors Over 3'-0" in Height to all Cabinets including throughout the Building.



## 08000 - Doors & Windows

Butts No. (706) Fast pin wrought bronze butt 3" x 2-1/2 and 3" x 3" x .092 gage 6 screws ea. hinge Doors 5' height and over 3 butts; lock No. (628B) Pin tumbler cylinder lock for lockers, bookcases, book cabs, supply cabs, etc.; pull, No. (655); bolts, No. (637) at top and bottom of inactive leaf of double doors. All active doors to have approved friction catch at top or bottom of doors.

C. Small Cupboard Doors, Doors under Counter Shelves, Counters and Storage Cabinets

Butts No. (706); lock (628B); Ives Elbow Catch No. 2MB -26D at top or bottom of inactive leaf of double doors; approved knob pulls; all active doors to have approved friction catch at top or bottom of doors.

D. Sliding Cabinet Doors

(Wood Frames) Two (2) 400A K&V sheaves; Top Track Garco No. 123; bottom track K&V 467 (for each pair doors); finger pull, 3/8" mortise K & V 801NF; as manufactured by Garden City Planting and Mfg. Co. locks shall be similar to 02291-X Corbin.

E. Hinged Doors -- Hanging Wall Cabinets over Sinks

Butts No. (706); friction catch; no knobs or locks required.

F. Sliding Cord Display Boards

K&V 400A sheaves, bottom track: K&V 467; approved aluminum angle pull: 2-1/8" x 1" for each door.

G. Doors to Metal Lined Cabinets

3" x 3" butts, 1-1/2 pair per door; bolts (637) top and bottom of inactive leaf; pull (655); lock (628B).

H. Sliding Hardboard Doors

K & V finger pull 803NP, one on each door.

3.1 INSTALLATION

3.1.1. Provide complete installation of all items of finish hardware.

3.1.2. Mount all hardware as recommended by the respective manufacturer.

3.1.3. Mount door (rooms) hardware items at heights and locations (on door and frame) in accordance with "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute, except where specifically directed otherwise.

3.1.4. Set hardware items plumb and level; secure with proper fasteners.

3.2 CLEANING AND ADJUSTING: Clean all hardware items thoroughly and adjust for proper operation

3.3 KEY OPERATION AND INSPECTION: Upon completion of the building and after all locks have been secured in their proper positions, all keys belonging thereto shall be fitted to and made to work freely in their respective locks, in the presence of the Contracting Officer's Representative, whereupon the required number of keys for each lock, properly marked, shall be delivered to the Contracting Officer, who will give a receipt therefor.



## 08000 - Doors & Windows

### 3.4 EXISTING BUILDING MODIFICATION

#### 3.4.1 Existing Doors Modified for Handicapped

Provide the following:

- a. Remove existing locksets and replace with new locksets as scheduled below.
- b. Add kickplates to push side of wood doors only.
- c. Modify and adjust the existing door closers so they will operate using a maximum pull of 8 pounds. Modified operation shall be quiet, even and uniform for use intended.
- d. Where necessary to accommodate closer adjustments, rehand and adjust the encountered door hardware to assure that all hardware for each adjusted door is working smoothly and quietly for use intended.

#### 3.4.2 Removals

- a. Where doors are to be removed as a part of the Work, all locksets, knobs, closers, butts and all other hardware of every kind shall be removed from the doors and shall remain the property of the Corpus Christi Army Depot.
- b. Where existing locksets are to be removed from existing doors which are to remain, and replaced with new handicapped locksets, all locksets shall be removed from these doors and remain the property of the Corpus Christi Army Depot.

3.4.3 The Contractor shall furnish to the Corpus Christi Army Depot an itemized breakdown of all removed hardware. A signed receipt shall be obtained from the Corpus Christi Army Depot and shall be submitted with the request for final payment.

3.4.4 Unless otherwise specified, all new locks for interior doors shall be masterkeyed in sets as hereinafter designated and grand masterkeyed for the entire building. Unless otherwise specified, all locks shall be furnished with three (3) keys. Keying for new locks shall be incorporated into the keying system of the existing building.

3.4.5 In all cases where rooms have two entrances from Corridor or adjoining rooms, the locks for these doors shall be keyed alike.

### 4.1 FINISH HARDWARE SCHEDULE

4.1.1 Provide hardware for each door, each pair of doors, and each set of doors, in compliance with the "Hardware Set Numbers" indicated on the Door Schedule which is to be prepared by the contractor and submitted for approval.

The following hardware sets are examples and do not include all conditions.

#### SET 1

Exterior Doors (Entrance)

Each Door:

1. Butts	1-1/2 Pair 6"x5" NRP	McKinney T4B3386
2. Exit Device	1	Precision 1103 x 17





## 08000 - Doors & Windows

(with rim cylinder)

- |  |   |                       |
|--|---|-----------------------|
| 3. Surface mounted   | 1 | LCN 4040              |
| (mounted with or concealed corner brackets) or Door Closer |   | LCN 2016 (concealed). |
| 4. Overhead Stop   | 1 | Glynn-Johnson         |
| with Holder  |   | 81MHD                 |

### SET 2

#### Exterior Doors (Exit)(without Cylinders)

##### Each Door:

- |  |                      |                       |
|--|----------------------|-----------------------|
| 1. Butts   | 1-1/2 Pair 6"x5" NRP | McKinney T4B3386      |
| 2. Exit Device   | 1                    | Precision 1102 x 17   |
| 3. Surface mounted   | 1                    | LCN 4040              |
| (mounted with or concealed corner brackets) or Door Closer |                      | LCN 2016 (concealed). |
| 4. Overhead Stop   | 1                    | Glynn-Johnson         |
| with Holder  |                      | 81MHD                 |

### SET 3

#### Exterior Door - Gas Meter Room and other Utility Rooms

##### Each Door:

- |                  |                      |                  |
|------------------|----------------------|------------------|
| 1. Butts         | 1-1/2 pair 6"x5" NRP | McKinney T4B3386 |
| 2. Lockset       | 1                    | Marks BE101J     |
| 3. Overhead Stop | 1                    | Glynn Johnson    |
| with Holder      |                      | 80M Series       |

### SET 4

#### Vestibule Doors

##### Each Door:

- |                    |                        |                |
|--------------------|------------------------|----------------|
| 1. Butts           | 1-1/2 Pair 5" x 4-1/2" | McKinney TA792 |
| 2. Pulls           | 1                      | Rockwood 130   |
| 3. Push Plate      | 1                      | Rockwood 71C   |
| 4. Surface Mounted | 1                      | LCN 4040       |



## 08000 - Doors & Windows

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Door Closer  
(Parallel mount,  
push side of door)

5. Overhead Stop                      1                      Glynn Johnson  
without Holder                      84MSHD Series  
(Heavy-duty with through bolts)

6. Silencers                      3                      Glynn Johnson 64

### SET 5

#### Cross-Corridor Doors (Double Doors)

##### Each Pair of Doors:

1. Butts	3 pairs 5"x 4-1/2"	McKinney TB3786
2. Push Plate	2	Rockwood 71C
3. Electro-Magnet	2	Rixson Smoke-Chek VI
Closer/Holder/ Release		one 6 Pull S and one 4 Pull S

### SET 6

#### Cross-Corridor Door (Single Door)

##### Each Door:

1. Butts	1-1/2 pair 5"x 4-1/2"	McKinney TB3786
2. Push Plate	1	Rockwood 71C
3. Pull	1	Rockwood 130
4. Electro-Magnet	1	Rixson Smoke-Chek VI
Closer/Holder/ Release		6 Pull S

### SET 7

#### Corridor-to-Stair

##### Each Door:

1. Butts	1-1/2 pair 5" x 4-1/2"	McKinney TA792
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## 08000 - Doors & Windows

2. Overhead Surface	1	LCN 4010
Mount Closer		
3. Overhead Stop	1	Glynn Johnson
without Holder		84MSHD Series
(Heavy Duty with through bolts)		
4. Pull	1	Rockwood 130
5. Push Plate	1	Rockwood 71C
6. Silencers	3	Glynn Johnson 64

### SET 8 --- NOT USED

### SET 9

#### Stair-to-Roof

#### Each Door:

1. Butts	1-1/2 pair 5" x 4-1/2"	McKinney TB2314
2. Lockset (lever	1	Marks BE 101J
at roof side		
always free)		
3. Surface Mounted	1	LCN 4015xBL
Door Closer		
4. Overhead Stop	1	Glynn Johnson
without Holder		84MS Series

### SET 10

#### Doors to Auditorium, Gymnasium, Cafeteria (Double Doors Without Mullions)

#### Each Pair of Doors:

1. Butts	3 pairs 4-1/2"x4-1/2"	McKinney TB2714
2. Exit Device	2	Precision FL 1208x9L
(with rim cylinder at active leaf)		
3. Surface Mounted	2	LCN 1461 DEL
Door Closer		



## 08000 - Doors & Windows

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4. Overhead Stop	2	Glynn Johnson
without Holder		84M Series
5. Pull	2	Rockwood 130
6. Silencers	4	Glynn Johnson 64
(2 each door head)		

### SET 11

#### Doors to Auditorium, Gymnasium, Cafeteria (Single Door)

##### Each Door:

1. Butts	1-1/2 pair 4-1/2"x4-1/2"	McKinney TB2714
2. Exit Device	1	Precision FL 1108x9L
(with rim cylinder)		
3. Surface Mounted	1	LCN 1461 DEL
Door Closer		
4. Overhead Stop	1	Glynn Johnson
without Holder		84M Series
5. Pull	1	Rockwood 130
6. Silencers	3	Glynn Johnson 64

### SET 12

#### Cafeteria-to-Serving Area

##### Each Door:

1. Butts	1-1/2 pair 4-1/2"x4-1/2"	McKinney TB2714
2. Lockset	1	Marks BE 101J
3. Surface Mounted	1	LCN 1461 DEL
Door Closer		
4. Electro-Magnetic	1	Rixson FM 993 with
Wall Mount Holder		manual release
5. Silencers	3	Glynn Johnson 64

### SET 13

#### Teachers' Lounge, Teachers' Lunchroom, Offices, Conference Room

##### Each Door:



## 08000 - Doors & Windows

1. Butts	1-1/2 pair 4-1/2"x4-1/2"	McKinney TB2714
2. Lockset	1	Marks BE 101J
3. Surface Mounted Door Closer	1	LCN 1461 DEL
4. Overhead Stop without Holder	1	Glynn Johnson 84M Series
5. Silencers	3	Glynn Johnson 64
6. Kick Plate	1	Ives 8400-S32D

### SET 14

#### Dutch Door at Teachers Lunchroom

##### Each Door:

1. Butts	2 Pairs 4-1/2" x 4-1/2"	McKinney TB2314
2. Lockset	1	Marks BE101J
3. Surface Mounted Door Closer	1	LCN 4010
4. Overhead Stop with Holder	1	Glynn Johnson 84M Series
5. Dutch Door Bolt	1	Ives 54
6. Silencers	4	Glynn Johnson 64

### SET 15

#### General Office

##### Each Door:

1. Butts	1-1/2 pair 4-1/2"x4-1/2"	McKinney TB2714
2. Lockset	1	Marks BE101J
3. Surface Mounted Door Closer	1	LCN 1461 DEL
4. Overhead Stop with Holder	1	Glynn Johnson 84M Series
5. Silencers	3	Glynn Johnson 64
6. Kick Plate	1	Ives 8400-S32D-B4E



## 08000 - Doors & Windows

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### SET 16

#### Holding Areas

##### Each Door:

1. Butts	1-1/2 pair 4-1/2"x4-1/2"	McKinney TB2714
2. Passage Set	1	Marks BE101N
3. Surface Mounted	1	LCN 1461 DEL
Door Closer		
4. Overhead Stop	1	Glynn Johnson
without Holder		84M Series
5. Silencers	3	Glynn Johnson 64

### SET 17

#### Classrooms, Other Rooms of Instruction, Library

##### Each Door:

1. Butts	1-1/2 pair 4-1/2"x4-1/2"	McKinney TB2714
2. Lockset	1	Marks BE101J
3. Surface Mounted	1	LCN 1461 DEL
Door Closer		
4. Overhead Stop	1	Glynn Johnson
without Holder		84M Series
5. Silencers	3	Glynn Johnson 64
6. Card Holder	1	Quality 1821
7. Kick Plate	1	Ives 8400-S32D-B4E

### SET 18

#### Boys' Toilets, Girls' Toilets

##### Each Door:

1. Butts	1-1/2 pair 4-1/2"x4-1/2"	McKinney TB2714
2. Lockset	1	Marks BE101J
3. Surface Mounted	1	LCN 1461 DEL
Door Closer		
4. Overhead Stop	1	Glynn Johnson
without Holder		84M Series



## 08000 - Doors & Windows

5. Silencers	3	Glynn Johnson 64
6. Kick Plate	1	Ives 8400-S32D-B4E

### SET 19

#### Toilets-to-Pipe Space

##### Each Door:

1. Butts	1 Pair 4-1/2" x 4-1/2"	McKinney TB 2314
2. Rim Latch	1	Yale 80
3. Overhead Stop without Holder	1	Glynn Johnson 84M Series
4. Silencers	2	Glynn Johnson 64"

### SET 20

#### Kindergarten and Classroom Toilets

##### Each Door:

1. Butts	1-1/2 Pair 4-1/2"x4-1/2"	McKinney TB2714
2. Passage Set	1	Marks BE 101N
3. Surface Mounted Door Closer	1	LCN 1461 DEL
4. Overhead Stop without Holder	1	Glynn Johnson 83M Series
5. Kick Plate	1	Ives 8400-S32D-B4E
6. Silencers	3	Glynn Johnson 64

### SET 21

#### Staff Toilets (With Privacy Compartments)

##### Each Door:

1. Butts	1-1/2 pair 4-1/2"x4-1/2"	McKinney TB2714
2. Lockset	1	Marks BE101EW
3. Surface Mounted Door Closer	1	LCN 1461 DEL
4. Overhead Stop without Holder	1	Glynn Johnson 84M Series



## 08000 - Doors & Windows

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5. Silencers	3	Glynn Johnson 64
6. Kick Plate	1	Ives 8400-S32D-B4E

### SET 22

#### Private Toilets (Without Compartments)

##### Each Door:

1. Butts	1-1/2 pair 4-1/2"x4-1/2"	McKinney TB2714
2. Lockset	1	Marks BE101EW
3. Mortise Bolt (Privacy Set)	1	Ives 154 w/#5 Emergency Key & #146
Escutcheon		
4. Surface Mounted Door Closer	1	LCN 1461 DEL
5. Overhead Stop without Holder	1	Glynn Johnson 84M Series
6. Silencers	3	Glynn Johnson 64
7. Kick Plate	1	Ives 8400-S32D-B4E

### SET 23

#### Janitor's Sink Closets

##### Each Door:

1. Butts	1-1/2 pair 4-1/2"x4-1/2"	McKinney TB2714
2. Rim Latch	1	Yale 80
3. Surface Mounted Door Closer	1	LCN 4010
4. Overhead Stop with Holder	1	Glynn Johnson 84M Series
5. Pull	1	Rockwood 130
6. Silencers	3	Glynn Johnson 64

### SET 24

#### Female Locker Room, Male Locker Room





## 08000 - Doors & Windows

### Each Door:

1. Butts	1-1/2 Pair 4-1/2"x4-1/2"	McKinney TB2314
2. Lockset	1	Marks BE101J
3. Surface Mounted Door Closer	1	LCN 1461 DEL
4. Overhead Stop without Holder	1	Glynn Johnson 84 Series
5. Silencers	3	Glynn Johnson 64

### SET 25

#### Computer Rooms, Audio/Video Rooms, Telecommunication Rooms

### Each Door:

1. Butts	1-1/2 Pair 4-1/2"x4-1/2"	McKinney TB 2714
2. Lockset	1	Marks BE 101J
3. Surface Mounted Door Closer	1	LCN 1461 DEL
4. Overhead Stop without Holder	1	Glynn Johnson 84M Series
5. Silencers	3	Glynn Johnson 64
6. Kick Plate (if wood door)	1	Ives 8400-S32D-B4E
7. Security Lock Lock	1 4500-WD-3M for wood doors, 4500-HM-3M for hollow metal doors.	Securitech Mul-T-
Secur-A-Door 231 or 232.		
8. Silencers	3	Glynn Johnson 64

### SET 26

#### Typewriter Rooms

### Each Door:

1. Butts	1-1/2 Pair 4-1/2"x4-1/2"	McKinney TB 2714
2. Lockset	1	Marks BE 101J
3. Surface Mounted Door Closer	1	LCN 1461 DEL



## 08000 - Doors & Windows

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4. Overhead Stop without Holder	1	Glynn Johnson 84M Series
5. Kick Plate (if wood door)	1	Ives 8400-S32D
6. Silencers	3	Glynn Johnson 64
7. Security Lock Boltlock	1	Yale 197 Vertical

### SET 27

#### Receiving Room (Double Doors)

##### Each Pair of Doors:

1. Butts	3 Pairs 4-1/2" x 4-1/2"	McKinney TB2314
2. Pulls (one each door)	2	Rockwood 130
3. Surface Mounted Door Closer (on active door)	1	LCN 4010
4. Surface Bolts (top and bottom of inactive door)	2	Ives 143-12
5. Kick Plate (if wood door)	2	Ives 8400-S32D
6. Silencers (2 each at door head)	4	Glynn Johnson 64
7. Security Lock (active leaf)	1	Yale 197 Vertical Boltlock
8. Overhead Stop with Holder (One each door)	2	Glynn Johnson 84M Series

### SET 28

#### Store Rooms

##### Each Door:

1. Butts	1-1/2 pair 4-1/2"x4-1/2"	McKinney TB2714
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## 08000 - Doors & Windows

2. Rim Latch	1	Yale 80
3. Surface Mounted Door Closer	1	LCN 4010
4. Pull	1	Rockwood 130
5. Push Plate	1	Rockwood 71C
6. Silencers	3	Glynn Johnson 64

### SET 29

#### Furniture Store, Scaffolding Store

##### Each Door:

1. Butts	1-1/2 Pair 5" x 4-1/2"	McKinney TB2314
2. Rim Latch	1	Yale 80
3. Surface Mounted Door Closer	1	LCN 4010
4. Overhead Stop with Holder	1	Glynn Johnson 84M Series
5. Pulls	2	Rockwood 130
6. Silencers	3	Glynn Johnson 64

### SET 30

#### Vault (Hollow Metal Door and Frame)

##### Each Door:

1. Butts	1-1/2 Pair 4-1/2"x4-1/2"	McKinney TB2314
2. Rim Latch	1	Yale 80
3. Surface Mounted Door Closer	1	LCN 4010
4. Pulls	2	Rockwood 130
5. Security Lock 3M	1	Securitech Mul-T-Lock 4500-HM-
6. Silencers	3	Glynn Johnson 64

### SET 31



## 08000 - Doors & Windows

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### Equipment Rooms, Storage Rooms (Double Doors)

#### Each Pair of Doors:

- |   |                         |                   |
|---|-------------------------|-------------------|
| 1. Butts  | 3 pairs 4-1/2" x 4-1/2" | McKinney TB2714   |
| 2. Pulls  | 2                       | Rockwood 130      |
| (one each door)   |                         |                   |
| 3. Surface Mounted  | 1                       | LCN 4010          |
| Door Closer (on active door)  |                         |                   |
| 4. Surface Bolts  | 2                       | Ives 143-12       |
| (top and bottom of inactive door)   |                         |                   |
| 5. Silencers  | 4                       | Glynn Johnson 64  |
| ( 2 each leaf at door head)   |                         |                   |
| 6. Security Lock  | 1                       | Yale 197 Vertical |
| Boltlock  |                         |                   |
| (Mount on inactive door when doors swing out. Mount on active door when swinging in). |                         |                   |
| 7. Overhead Stop  | 2                       | Glynn Johnson     |
| with Holder   |                         | 84M Series        |
| (one each door)   |                         |                   |
| 8. Kick Plate   | 2                       | Ives 8400-S32D    |
| (if wood door)  |                         |                   |

### SET 32

### Gas Meter Room, Electric Switch Room

#### Each Door:

- |                    |                          |                  |
|--------------------|--------------------------|------------------|
| 1. Butts           | 1-1/2 Pair 4-1/2"x4-1/2" | McKinney TB2314  |
| 2. Rim Latch       | 1                        | Yale 80          |
| 3. Surface Mounted | 1                        | LCN 4010         |
| Door Closer        |                          |                  |
| 4. Pulls           | 2                        | Rockwood 130     |
| 5. Overhead Stop   | 1                        | Glynn Johnson    |
| with Holder        |                          | 84M Series       |
| 6. Silencers       | 3                        | Glynn Johnson 64 |



## 08000 - Doors & Windows

### SET 33

#### Mechanical Room, Electric Service Room

##### Each Door:

1. Butts	1-1/2 Pair 4-1/2"x4-1/2"	McKinney TB2314
2. Exit Device (with rim cylinder)	1	Precision FL 1103 x 9L
3. Surface Mounted Door Closer	1	LCN 4040
4. Overhead Stop 1 without Holder		Glynn Johnson 84M Series
5. Silencers	3	Glynn Johnson 64

### SET 34

#### Boiler Room

##### Each Door:

1. Butts	1-1/2 Pair 5" x 4-1/2"	McKinney TB2314
2. Exit Device (with rim cylinder)	1	Precision FL 1108x9L
3. Surface Mounted Door Closer	1	LCN 4040
4. Overhead Stop 1 without Holder		Glynn Johnson 84M Series
5. Silencers	3	Glynn Johnson 64

### SET 35

#### Fuel Chamber

##### Each Door:

1. Butts	1 Pair 4-1/2" x 4-1/2"	McKinney TB2314
2. Exit Device (with rim cylinder)	1	Precision FL 1108x9L
3. Surface Mounted	1	LCN 4040



## 08000 - Doors & Windows

Door Closer		
4. Overhead Stop	1	Glynn Johnson
without Holder		84M Series
5. Silencers	3	Glynn Johnson 64

### SET 36

#### Elevator Machine Room

#### Each Door

1. Butts	1-1/2	Pair 4-1/2"x4-1/2"	McKinney TB2714
2. Lockset	1		Marks BE102 x EW
3. Surface Mounted	1		LCN 4010
Door Closer			
4. Overhead Stop 1			Glynn Johnson
without Holder			84M Series

## 4.2 KEYING

- 4.2.1 Unless otherwise specified, all locks for exterior doors shall be masterkeyed in sets; furnish 3 keys for each lock.
- 4.2.2 Unless otherwise specified, all locks for interior doors shall be masterkeyed in sets as hereinafter designated and grand masterkeyed for the respective floors and great grand masterkeyed for the entire building. Unless otherwise specified, furnish 3 keys for each lock.
- 4.2.3 For existing buildings, incorporate keying for new locks into the existing keying system.
- 4.2.4 Keying Schedule
- Custodial: Boiler Room, Switchboard Room, Help's Locker Room, Engineer's Closet, Pipe and Duct Spaces, Fan Room:  
Separate combinations for each room, masterkeyed in one set.
  - Lunchroom Area: Lunchroom, Store Room, Help's Locker Room, Gas Valve Closet:  
Separate combination for each room, masterkeyed in one set.
  - Gymnasium: Gymnasium, Apparatus Room, Office, Auxiliary Gymnasium, Locker Rooms, and other ancillary Rooms:  
Separate combination for each room, masterkeyed in one set.
  - Auditorium: Auditorium (one door), Men's and Women's Toilets, Property Room, and other ancillary Rooms:  
Separate combination for each room, masterkeyed in one set.



## 08000 - Doors & Windows

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- e. Administrative: Staff Offices, Toilet, and Closet, General Office, and Switchboard, File and Mimeo Room, Sound System Control Closet:  
Separate combinations for each room, masterkeyed in one set.
- f. Custodian: Custodian's Office and Store Room:  
One combination.
- g. Offices:
  - 1. Offices and Waiting Rooms.  
Separate combination for each room, masterkeyed in one set.
  - 2. Office throughout Building not otherwise specified. Separate combination for each room, masterkeyed in one set.
- h. Kitchen Area: Kitchen, Store Rooms, other Ancillary Rooms: Separate combination for each room, masterkeyed in one set.
- i. Miscellaneous:
  - 1. Store Rooms from Corridors.  
Separate combination for each room, masterkeyed in one set. The grand masterkey for each floor shall pass the above door locks occurring on each floor.
  - 2. Doors to Store Rooms within Rooms:  
Same combination as room door.

END OF SECTION 08710



## SECTION 08720

### OPERATORS

#### 1.0 GENERAL

##### 1.1 Description of Work

1.1.1 This specification covers the furnishing and installation of power operators, electro-mechanical, hydraulic, and pneumatic, for personnel doors, including the following types of door operators:

- a. Power units for one-way swing doors
- b. Power units for two-way swing doors
- c. Power units for single sliding doors
- d. Power units for biparting sliding doors.

Products shall be as directed by the Corpus Christi Army Depot. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

1.1.2 Compressed air supply and connections to the building compressed air system are specified in Division 15.

1.1.3 Electrical connections are specified in Division 16.

##### 1.2 Product Data

1.2.1 Submit product data for each door operator type required, including the manufacturer's standard details and fabrication methods and general published recommendations for each component of the door operating systems required, and the following:

- a. Roughing-in diagrams.
- b. Certified performance reports.
- c. Installation instructions.
- d. Parts lists.

1.2.2 Submit wiring diagrams detailing wiring for power operator, signal, and control systems. Clearly differentiate between manufacturer-installed wiring and field-installed wiring.

1.2.3 Submit manufacturer's maintenance and service data for door operators and control system including the name, address and telephone number of the nearest authorized service representative.

##### 1.3 Fire-Rated and Emergency Exit Openings

1.3.1 Provide door operators that comply with NFPA 80 requirements for doors as emergency exits, and do not interfere with fire ratings.





- 1.3.2 BHMA Standard: Provide power door operators that comply with applicable requirements of ANSI A156.10 (BHMA 1601), Power Operated Pedestrian Door Standard.
- 1.3.2.1 Power door operators intended to aid the physically handicapped by acting as an automatic door operator and manual door closer shall comply with the applicable requirements of ANSI A117.1 "Specifications for Making Buildings and Facilities Accessible To and Usable by physically Handicapped People" and ANSI A156.19 "Power Assist and Low Energy Power Operated Doors."
- 1.3.3 UL Standard: Provide power door operators that comply with UL 325.
- 2.0 PRODUCTS
- 2.1 Manufacturers
- 2.1.1 Subject to compliance with requirements, provide power door operators from one of the following:
  - a. Electro-Mechanical-Operated Swinging Units:
    - 1. Besam, Inc.
    - 2. Dor-O-Matic, Division of Republic Industries, Inc.
    - 3. Gyro-Tech, Inc.
    - 4. Horton Automatics, Division of Overhead Door Corp.
    - 5. Keane Monroe Corp.
    - 6. Stanley Magic-Door, Division of the Stanley Works.
  - b. Electro-Mechanical-Operated Sliding Units:
    - 1. Besam, Inc.
    - 2. B.W.N. Industries.
    - 3. Dor-O-Matic, Division of Republic Industries, Inc.
    - 4. Gyro-Tech, Inc.
    - 5. Horton Automatics, Division of Overhead Door Corp.
    - 6. Keane Monroe Corp.
    - 7. Stanley Magic-Door, Division of the Stanley Works.
  - c. Hydraulic-Operated Swinging Units:
    - 1. Besam, Inc.
    - 2. Keane Monroe Corp.
  - d. Pneumatic-Operated Swinging Units:
    - 1. Horton Automatics Division of Overhead Door Corp.
  - e. Pneumatic Operated Sliding Units:
    - 1. Horton Automatics Division of Overhead Door Corp.
- 2.2 General Door Operator Requirements



## 08000 - Doors & Windows

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- 2.2.1 Capacity: Provide operators of the size recommended by the manufacturer for the door size, weight, and movement, for condition of exposure, and for long-term, maintenance-free operation under normal traffic load for the type of occupancy indicated.
- 2.2.2 Hinge Operation: For swing type doors, refer to Division 8 Section "Finish Hardware" to determine type of hinge action to be matched by the door operator action.
- 2.2.3 Exposed Housing: Minimum 0.062-inch (1.6-mm) thick extruded or formed aluminum cover with provisions for maintenance access. Provide fasteners that are concealed when door is in the closed position. Finish to match doors and frames.
- 2.2.4 Exposed Housing for Operators: Minimum 0.0598-inch (1.5-mm) thick formed sheet steel cover with provisions for maintenance access. Provide with fasteners concealed when door is in closed position. Provide in manufacturer's standard prime coat finish for field painting.
- 2.2.5 Adjustment Features: Operators shall be fully adjustable. Provide adjustment for opening, closing, and checking speeds, as well as length of time the door remains open.
- 2.3 Swinging Door Operators
  - 2.3.1 Electro-Mechanical Operator for Swinging Doors: Provide the manufacturer's standard electro-mechanical unit with doors power-opened and spring-closed, with the closing speed controlled mechanically by gear train and dynamically by braking action of electric motor and, with easy manual operation including spring closing with power off. Provide operator action as indicated and mounting as indicated below:
    - a. Operator Mounting Type: Concealed overhead operator or surface-mounted overhead operator, as required.
    - b. Power-Assisted Closing: Provide power-assisted spring closing for overcoming wind and static pressures.
    - c. Fire Door Accessories: Provide fire door accessory package consisting of UL-listed latch mechanism power reset box, and caution labels for fire-resistance rated doors indicated for electro-mechanical operation.
    - d. For center-pivoted doors provide emergency release for reverse swing action of doors which are indicated or required to function as exits.
  - 2.3.2 Hydraulic Operator for Swinging Doors: Provide the manufacturer's standard low-pressure unit with separate cylinders for power and checking. Provide spring action for closing under manual operation, and emergency release for manual swing-out action on swing-in doors which are indicated to function as exits. Provide operator action as indicated.
    - a. Operator Mounting Type: Concealed overhead operator, surface-mounted overhead operator, or recessed floor type operator, as required.
    - b. Provide self-contained units with connections for power and control wiring.
    - c. Provide remote power unit located as shown with interconnecting tubes and connections at power unit for power and control wiring. Wherever feasible, operate all of the door operators in one area of the building from a single power unit.



- 2.3.3 Pneumatic Operator for Swinging Doors: Provide the manufacturer's standard pneumatic operator, air-opened and spring-closed, checking in both cycles, with doors manually operable when power is off. Provide operator action as indicated.
- a. Operator Mounting Type: Concealed overhead operator or surface-mounted overhead operator, as required.
  - b. Where "2-Way Air" operation is indicated, provide air-powered operation for both opening and closing of doors, with power checking, and with easy manual operation of doors when power or air pressure is off.
  - c. Power Unit: Manufacturer's standard remote compressor unit, complete with tank, compressor, motor, regulator, safety valve, pressure cut-off switch, and automatic air line filter drain.
- 2.4 Sliding Door Operators
- 2.4.1 Electro-Mechanical Operators for Sliding Doors: Provide self-contained, concealed, overhead electro-mechanical drive unit, with power opening and either power or spring closing, and checking for both opening and closing cycles. Include connections for power and control wiring. Provide safety release clutch for obstructed closing. Provide for easy manual sliding when power is off. Provide operator action as indicated.
- a. Provide emergency breakaway swing feature.
- 2.4.2 Pneumatic Operators for Sliding Doors: Manufacturer's standard pneumatic unit, air-opened and air-closed, with pneumatic checking in both cycles, and safety release clutch for obstructed closing. Provide for manual sliding when air pressure is off. Provide metal track and header assembly with ball-bearing rollers on door hangers. Provide operator action as indicated.
- a. Fire Doors: Where doors are fire rated, provide counterweight assembly for automatic (non-power-driven) closing of doors bearing UL and FM labels of approval.
  - b. Operator Mounting Type: Semiconcealed overhead operator or surface-mounted overhead operator, as required.
  - c. Power Unit: Manufacturer's standard remote compressor unit, complete with tank, compressor, motor, regulator, safety valve, pressure cut-off switch, and automatic air line filter drain.
- 2.5 Operator Control Systems
- 2.5.1 Floor Mat Control Panels: Provide floor mat control panels intended for either sliding or single-acting swing door control, with both "Actuating" and "Safety" section switches. Provide mats of sizes indicated, but not smaller than required by ANSI A156.10. Provide pressure switches for low-voltage control wiring.
- a. Mat: 1/2-inch (13-mm) thick synthetic rubber or flexible plastic mat in safety-ribbed surface pattern, color as selected by the Owner.
  - b. Recessed Mat Frame: Extruded aluminum mat frame recessed to fit flush with floor; provide manufacturer's standard concealed anchorage.
  - c. Surface-Mounted Mat Frame: Surface-mounted extruded aluminum frame with tapered safety edge where mat is installed over existing floor finish.



## 08000 - Doors & Windows

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- 2.5.2 Microwave Scanner Motion-Detecting Control System: Provide a self-contained motion-detecting control system composed of a micro-wave scanner sensing device to activate door operator and horizontal photo-cell beam across door opening to prevent door from closing until door is clear of traffic. Sensing device shall be adjustable to provide detection patterns and sensitivity equivalent to those required for mats. Provide housing for sensing device finished to match finish of doors and frames.
- a. Install scanners on both interior and exterior of each automatic sliding entrance door or install scanners on approach side of each automatic entrance door, as indicated.
- 2.5.3 Infrared Scanner Motion-Detecting Control System: Provide self-contained, motion-detection control system composed of an infrared sensing device to activate door operator and a horizontal photo-cell beam across door opening to prevent door from closing until door is clear of traffic. Sensing device shall be adjustable to provide detection patterns and sensitivity equivalent to those required for mats. Provide housing for sensing device finished to match finish of doors and frames.
- a. Install scanners on both interior and exterior of each automatic sliding entrance door or install scanners on approach side of each automatic entrance door, as indicated.
- 2.5.4 Photo-Cell Control System: Provide the manufacturer's standard horizontal beam photo cell control system, arranged as indicated.
- 2.5.5 Wall Push-Plate Switch: Manufacturer's standard semiflush, wall-mounted door control switch plate intended for operation by touch of elbow by occupants familiar with door operating system.
- 2.5.6 Pull-Cord Switch: Manufacturer's standard overhead-mounted, momentary-contact switch activating door opening cycle. Provide pull cord in sufficient length for use by pedestrian and truck traffic.
- 2.5.7 Floor Switch: Manufacturer's standard flush-mounted floor plate door control switch intended for operation by touch of toe by occupants familiar with door operating system.
- 2.6 Accessories
- 2.6.1 Guide Rails: Provide anodized aluminum bar-stock guide rails of the same length as floor mats for freestanding floor mounting as indicated.
- a. Equip rails with filler panels of expanded aluminum mesh for maximum control of traffic on and off of the floor mat control panels or equip rails with fill panels of polycarbonate plastic in clear or color as selected by the Owner from the manufacturer's standard choices.
- 3.0 EXECUTION
- 3.1 Preparation
- 3.1.1 Templates and Diagrams: Furnish templates, diagrams, and other data to fabricators and installers of related work, as necessary, for coordination of the power door operator installation.
- 3.2 Installation
- 3.2.1 General: Comply with manufacturer's recommendations.
- 3.2.2 Install complete power door operator system in accordance with manufacturer's instructions, including controls, control wiring, and remote power units.
- a. Refer to Division 16 Sections for power connection specifications.



## 08000 - Doors & Windows

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- 3.2.3 Set tracks, header assemblies, operating brackets, rails, and guides level and true to location with adequate anchorage for permanent support.
- 3.3 Adjusting
- 3.3.1 After repeated operation of completed installation equivalent to 3 days use by normal traffic (100 to 300 cycles), readjust door operators and controls for optimum operating condition and safety, and for a weather tight closure. Lubricate hardware, operating equipment, and other moving parts.

END OF SECTION 08720



## SECTION 08721

### AUTOMATIC DOOR EQUIPMENT

#### 1.0 GENERAL

##### 1.1 Description of Work

1.1.1 This specification covers electric powered automatic door equipment for rolling metal doors.

1.1.2 Electrical connections for powered operators and accessories are specified in Division 16.

##### 1.2 Submittals

1.2.1 Product Data: Submit product data, roughing-in diagrams, and installation instructions.

- a. Provide operating instructions and maintenance information.
- b. Provide information describing fire-release system including electrical rough-in instructions.

1.2.2 Shop Drawings: Submit wiring drawings.

#### 2.0 PRODUCTS

##### 2.1 Manufacturers

2.1.1 Subject to compliance with requirements, provide products by one of the following:

- a. Atlas Roll-Lite Overhead Doors/Div. of MASCO.
- b. Ceco/Windsor Door--Div. of the Ceco Corp.
- c. The Cookson Co.
- d. Cornell Iron Works Inc.
- e. Mahon Door Corp.
- f. Overhead Door Corp.
- g. Wayne-Dalton Corp.
- h. J. G. Wilson Corp.

##### 2.2 Electric Door Operators

2.2.1 General: Furnish electric door operator assembly of size and capacity recommended and provided by door manufacturer; complete with electric motor and factory-prewired motor controls, gear-reduction unit, solenoid-operated brake, remote control stations, control devices, conduit and wiring from controls to motor and central stations, and accessories required for proper operation.

2.2.2 Provide hand-operated disconnect or a mechanism for automatically engaging a sprocket-and-chain operator and releasing brake for emergency manual operation. Mount disconnect and operator so



- they are accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.
- 2.2.3 Design operator so that motor may be removed without disturbing limit-switch adjustment and without affecting emergency auxiliary operator.
- 2.2.4 Door Operator Type: Provide wall- or bracket-mounted door operator units consisting of electric motor, worm gear drive from motor to reduction gear box, chain or worm gear drive from reduction box to gear wheel mounted on counterbalance shaft, and a disconnect-release for manual operation. Provide motor and drive assembly of horsepower and design as determined by door manufacturer for size of door required.
- 2.2.5 Electric Motors: Provide 1/2 HP high-starting torque, reversible, Class A insulated electric motors with overload protection.
- a. Coordinate wiring requirements and current characteristics of motors with building electrical system.
  - b. Furnish open drip-proof type motor.
  - c. Furnish totally enclosed, non-ventilated type motors, fitted with plugged drain, for exterior applications and where indicated.
- 2.2.6 Remote Control Station: Provide momentary-contact, three-button control station with push-button controls labeled "Open," "Close," and "Stop."
- a. Provide interior units, full-guarded, surface-mounted, heavy-duty, with general-purpose NEMA Type 1 enclosure.
  - b. Provide exterior units, full-guarded type, standard-duty, surface-mounted, weatherproof, NEMA Type 4 enclosure, key-operated.
- 2.2.7 Automatic Reversing Control: Furnish each door with an automatic safety switch, extending the full width of door bottom, and located within neoprene or rubber astragal mounted to bottom door rail. Contact with switch before fully closing will immediately stop downward travel and reverse direction to fully opened position.
- a. Connect to control circuit through retracting safety cord and reel, or self-coiling cable.
  - b. Provide electrically actuated automatic bottom bar.
- 3.0 Installation
- 3.1.1 General: Install operating equipment complete according to final shop drawings, manufacturer's instructions, and as specified.
- 3.1.2 Train Corpus Christi Army Depot maintenance personnel on procedures and schedules related to door operation, servicing, preventive maintenance, and procedures for resetting closing devices after activation.

END OF SECTION 08721



## SECTION 08730

### WEATHER STRIPPING AND SEALS

#### 1.0 GENERAL

##### 1.1 Description of Work

- 1.1.1 This specification covers the furnishing and installation of weather-stripping and seals for wood and/or metal personnel type doors. Products shall be as directed by the Corpus Christi Army Depot. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

##### 1.2 Submittals

- 1.2.1 Product Data: Submit product data, including manufacturers' technical product data for each item of weather-stripping and seals, installation instructions, maintenance of finish, and other information necessary to show compliance with requirements, to the Corpus Christi Army Depot for approval.

- 1.2.2 Schedule: Submit schedule coordinated with doors, frames, and related work to ensure proper size and finish of weather-stripping and seals.

- a. Schedule Content: Organize schedule into "sets" indicating complete designations of every item required for each door or opening. Include the following information:

1. Type, style, size, and finish of each hardware item.
2. Name and manufacturer of each item.
3. Fastenings and other pertinent information.
4. Location of each set cross referenced to indications on Drawings both on floor plans and in door and frame schedule.
5. Explanation of all abbreviations, symbols, and codes contained in schedule.

- 1.2.3 Samples: Submit three (3) samples of each type of unit to the Corpus Christi Army Depot for approval, in finish indicated and tagged with full description for coordination with schedule. Submit samples prior to submission of final schedule.

- 1.2.4 Templates: Submit templates for weather-stripping and seals where specified to be factory installed on doors. Check shop drawings of other work to confirm that adequate provisions are made for locating and installing items to comply with indicated requirements.

##### 1.3 Label Requirements

- 1.3.1 Fire-Rated Openings: Provide weather-stripping and seals for fire-rated openings that complies with NFPA Standard No. 80 and requirements of authorities having jurisdiction. Provide only items that are listed and are identical to products tested by UL, Warnock Hersey, FM, or other testing and inspecting organization acceptable to authorities having jurisdiction for use on types and sizes of doors indicated in compliance with requirements of fire-rated door and door frame labels.





- 1.4 Product Handling
- 1.4.1 Tag each item or package separately with identification related to schedule, and include basic installation instructions with each item or package.
- 2.0 PRODUCTS
- 2.1 Manufacturers
- 2.1.1 Subject to compliance with requirements, provide products by one of the following:
  - a. Hager Hinge Co.
  - b. National Guard Products, Inc.
  - c. Pemko Manufacturing Co., Inc.
  - d. Reese Enterprises, Inc.
  - e. Sealeze Corp.
  - f. Ultra Industries.
  - g. Zero International, Inc.
- 2.7 Weather-stripping and Seals
- 2.7.1 General: Provide continuous weather-stripping on exterior doors and smoke, light, or sound seals on interior doors where indicated or scheduled. Provide non-corrosive fasteners for exterior applications and elsewhere as indicated.
- 2.7.2 Replaceable Seal Strips: Provide only those units where resilient or flexible seal strip is easily replaceable and readily available from stocks maintained by manufacturer.
- 2.7.3 strips, surface applied unless shown as mortised or semimortised, and of following metal, finish, and resilient bumper material:
  - a. Extruded aluminum with natural anodized finish, 0.062-inch (1.6-mm) minimum thickness of main walls and flanges.
  - b. Extruded aluminum with color anodized finish as selected from manufacturer's standard color range, 0.062-inch (1.6-mm) minimum thickness of main walls and flanges.
  - c. Extruded bronze (brass), finish to match frame, 0.050-inch (1.3-mm) minimum thickness of main walls and flanges.
  - d. Sponge neoprene conforming to MIL R 6130, Class II (Closed Cell).
    - 1. Grade A: 30 to 150 deg F (-1 to 65 deg C), oil-resistant and self-extinguishing.
    - 2. Grade B: 30 to 150 deg F (-1 to 65 deg C), non-oil-resistant.
    - 3. Grade C: 67 to 170 deg F (19 to 77 deg C), low temperature.
  - e. Expanded neoprene: Cellular rubber conforming to ASTM D 1056 Type 2 (closed-cell); Class B (low-swell, oil-resistant); Grade 2 (compression-deflection of 5 - 9 psi (35 - 60 kPa)); and self-extinguishing in following size:



## 08000 - Doors & Windows

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1. 3/16 x 5/8 inch (5 x 16 mm).
  2. 1/4 x 3/4 inch (6 x 19 mm).
  3. 3/8 x 1-1/4 inches (10 x 32 mm).
- f. Solid neoprene conforming to MIL R 6855, Class II, Grade 40.
1. Flexible, hollow bulb or loop insert.
- g. Flexible vinyl hollow bulb or loop insert.
- h. Brush pile insert of polypropylene or nylon woven pile and aluminum strip backing complying with AAMA 701.2.

2.7.4 Weather-stripping at Door Bottoms: Provide threshold consisting of contact-type resilient insert and metal housing of design and size shown and of following metal, finish, and resilient seal strip:

- a. Extruded aluminum with natural anodized finish, 0.062-inch (1.6-mm) minimum thickness of main walls and flanges.
- b. Extruded aluminum with color anodized finish as selected from manufacturer's standard color range, 0.062-inch (1.6-mm) minimum thickness of main walls and flanges.
- c. Extruded bronze (brass) finished to match doors, 0.050-inch (1.3-mm) minimum thickness of main walls and flanges.
- d. Solid neoprene wiper or sweep seal complying with MIL R 6855, Class II, Grade 40.
- e. Flexible vinyl wiper or sweep seal strip.
- f. Brush pile insert of polypropylene or nylon woven pile and aluminum strip backing complying with AAMA 701.2.

### 3.0 EXECUTION

#### 3.1 Installation

3.1.1 Mount weather-stripping and seals at heights indicated in following applicable publications, except as specifically indicated or required to comply with governing regulations.

1. "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute.
2. "Recommended Locations for Builders Hardware for Custom Steel Doors and Frames" by the Door and Hardware Institute.
3. NWWDA Industry Standard I.S.1.7, "Hardware Locations for Wood Flush Doors."

3.1.2 Install each item in compliance with the manufacturer's instructions and recommendations. Where cutting and fitting is required to install hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation or application of surface protection with finishing work specified in the Division 9 Sections. Do not install surface-mounted items until finishes have been completed on the substrates involved.

3.1.3 Set units level, plumb, and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.



## 08000 - Doors & Windows

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- 3.1.4 Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.
- 3.1.5 Weather-stripping and Seals: Comply with manufacturer's instructions and recommendations to the extent installation requirements are not otherwise indicated.

END OF SECTION 08730



## SECTION 08740

### THRESHOLDS

#### 1.0 GENERAL

##### 1.1 Description of Work

- 1.1.1 This specification covers the furnishing and installation of thresholds for wood and/or metal personnel type doors. Products shall be as directed by the Corpus Christi Army Depot. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

##### 1.2 Submittals

- 1.2.1 Product Data: Submit product data, including manufacturers' technical product data for each threshold, installation instructions, maintenance of finish, and other information necessary to show compliance with requirements, to the Corpus Christi Army Depot for approval.

- 1.2.2 Schedule: Submit schedule coordinated with doors, frames, and related work to ensure proper size and finish of threshold.

- a. Schedule Content: Organize schedule into "sets" indicating complete designations of every item required for each door or opening. Include the following information:

1. Type, style, size, and finish of each hardware item.
2. Name and manufacturer of each item.
3. Fastenings and other pertinent information.
4. Location of each set cross referenced to indications on Drawings both on floor plans and in door and frame schedule.
5. Explanation of all abbreviations, symbols, and codes contained in schedule.

- 1.2.3 Samples: Submit three (3) samples of each type of unit to the Corpus Christi Army Depot for approval, in finish indicated and tagged with full description for coordination with schedule. Submit samples prior to submission of final schedule.

##### 1.3 Label Requirements

- 1.3.1 Fire-Rated Openings: Provide thresholds for fire-rated openings that complies with NFPA Standard No. 80 and requirements of authorities having jurisdiction. Provide only items that are listed and are identical to products tested by UL, Warnock Hersey, FM, or other testing and inspecting organization acceptable to authorities having jurisdiction for use on types and sizes of doors indicated in compliance with requirements of fire-rated door and door frame labels.

##### 1.4 Product Handling



- 1.4.1 Tag each item or package separately with identification related to schedule, and include basic installation instructions with each item or package.
- 2.0 PRODUCTS
- 2.1 Manufacturers
- 2.1.1 Subject to compliance with requirements, provide products by one of the following:
  - a. Hager Hinge Co.
  - b. National Guard Products, Inc.
  - c. Pemko Manufacturing Co., Inc.
  - d. Reese Enterprises, Inc.
  - e. Sealeze Corp.
  - f. Zero International, Inc.
- 2.2 Thresholds
- 2.2.1 General: Except as otherwise indicated, provide standard metal threshold unit of type, size, and profile as shown or scheduled.
- 2.2.2 Exterior Hinged or Pivoted Doors: Provide units not less than 4 inches (100 mm) wide, formed to accommodate change in floor elevation where indicated, fabricated to accommodate door hardware and to fit door frames, and as follows:
  - a. For in-swinging doors provide units with interlocking lip and interior drain channel; include hook on bottom edge of door and drain pan.
  - b. For out-swinging doors provide units with interlocking lip and with hook on bottom edge of door to act as weather bar.
  - c. For out-swinging doors provide rabbeted type units with replaceable weatherstrip insert in stop.
- 3.0 EXECUTION
- 3.1 Installation
- 3.1.1 Install each item in compliance with the manufacturer's instructions and recommendations. Where cutting and fitting is required to install hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation or application of surface protection with finishing work specified in the Division 9 Sections. Do not install surface-mounted items until finishes have been completed on the substrates involved.
- 3.1.2 Set units level, plumb, and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
- 3.1.3 Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.
- 3.1.4 Set thresholds for exterior doors in full bed of butyl-rubber or polyisobutylene mastic sealant complying with requirements specified in Division 7 Section "Joint Sealers."



## 08000 - Doors & Windows

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END OF SECTION 08740



## SECTION 08750

### VISION GLASS

#### 1.0 GENERAL

##### 1.1 Description of Work

- 1.1.1 This specification covers the furnishing and installation of vision glass for wood and/or metal framed openings. Products shall be as directed by the Corpus Christi Army Depot. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

##### 1.2 Submittals

- 1.2.1 Product Data: Submit product data for each glass product and glazing material indicated., to the Corpus Christi Army Depot for approval.

- 1.2.2 Samples: Submit to the Corpus Christi Army Depot for approval, three (3) 12-inch (300 mm) square samples of glass, and three (3) 12-inch (300 mm) long samples of each color required (except black) for each type of sealant or gasket exposed to view. Install sealant or gasket sample between two strips of material representative in color of the adjoining framing system.

- 1.2.3 Product Certificates: Submit product certificates signed by glazing materials manufacturers certifying that their products comply with specified requirements.

##### 1.2.4 Test Reports

- 1.2.4.1 Submit compatibility and adhesion test reports from sealant manufacturer indicating that glazing materials were tested for compatibility and adhesion with glazing sealants. Include sealant manufacturer's interpretation of test results relative to sealant performance and recommendations for primers and substrate preparation needed for adhesion.

- 1.2.4.2 Submit product test reports for each type of glazing sealant and gasket indicated, evidencing compliance with requirements specified.

- 1.2.5 Maintenance Data: Submit maintenance data for glass and other glazing materials.

##### 1.3 Quality Assurance

- 1.3.1 Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, except where more stringent requirements are indicated. Refer to "FGMA Glazing Manual" for glazing terms not otherwise defined in this Section or in referenced standards.

- 1.3.2 Safety Glass: Products complying with ANSI Z97.1 and testing requirements of 6 CFR Part 1201 for Category II materials.

- a. Subject to compliance with requirements, provide safety glass permanently marked with certification label of Safety Glazing Certification Council (SGCC) or other certification agency acceptable to authorities having jurisdiction.



## 08000 - Doors & Windows

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### 1.4 Product Handling

- 1.4.1 Protect glazing materials to comply with manufacturer's directions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- 1.4.2 Protect glazing materials to comply with manufacturer's directions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

### 1.5 Project Conditions

- 1.5.1 Environmental Conditions: Do not proceed with glazing when ambient and substrate temperature conditions are outside the limits permitted by glazing materials manufacturer or when glazing channel substrates are wet from rain, frost, condensation, or other causes.

- a. Install liquid sealants at ambient and substrate temperatures above 40 deg F (4 deg C).

## 2.0 PRODUCTS

### 2.1 Manufacturers:

- 2.1.1 Subject to compliance with requirements, provide products by one of the following:

- a. AFG Industries, Inc.
  - b. Saint-Gobain.
  - c. Falconer Glass Industries.
  - d. Glasstemp, Inc.
  - e. Guardian Industries Corp.
  - f. PPG Industries, Inc.
  - g. Spectrum Glass Products, Inc.
  - h. Tempglass.
  - i. Viracon, Inc.

### 2.2 Vision Glass, Clear Tempered

- 2.2.1 Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed, unless otherwise indicated.
- 2.2.2 Uncoated, Clear, Heat-Treated (Tempered) Float Glass: ASTM C 1048, Condition A (uncoated surfaces), Type I (transparent glass, flat), Class 1 (clear), Quality q3 (glazing select), Kind FT (fully tempered).

### 2.3 Elastomeric Glazing Sealants

- 2.3.1 General: Provide products of type indicated, complying with the following requirements:





- a. Compatibility: Select glazing sealants and tapes of proven compatibility with other materials they will contact, including glass products and glazing channel substrates, under conditions of installation and service, as demonstrated by testing and field experience.
  - b. Suitability: Comply with sealant and glass manufacturer's recommendations for selecting glazing sealants and tapes that are suitable for applications indicated and conditions existing at time of installation.
  - c. Colors: Match colors indicated by reference to manufacturer's standard designations.
- 2.3.2 Elastomeric Glazing Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer indicated that comply with ASTM C 920 requirements including those referencing ASTM classifications for Type, Grade, Class and Uses.
- a. Additional Movement Capability: Provide products, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, with the capability to withstand the specified percentage change in the joint width existing at time of installation and remain in compliance with other requirements of ASTM C 920 for uses indicated.
- 2.4 Glazing Tapes
- 2.4.1 Back-Bedding Mastic Glazing Tape: Preformed, butyl-based elastomeric tape with a solids content of 100 percent, nonstaining and nonmigrating in contact with nonporous surfaces, with or without spacer rod as recommended by tape and glass manufacturers for application indicated, packaged on rolls with a release paper backing, and complying with AAMA 800 for products indicated below:
- a. AAMA 804.1.
  - b. AAMA 806.1.
  - c. AAMA 807.1.
- 2.4.2 Expanded Cellular Glazing Tape: Closed-cell, polyvinyl chloride foam tape, factory coated with adhesive on both surfaces, packaged on rolls with release liner protecting adhesive, and complying with AAMA 800 for product 810.5.
- 2.5 Glazing Gaskets
- 2.5.1 Lock-Strip Gaskets: Neoprene extrusions in size and shape indicated, fabricated into frame with molded corner units and zipper lock strips, complying with ASTM C 542, black.
- 2.5.2 Dense Compression Gaskets: Molded or extruded gaskets of material indicated below, complying with standards referenced with name of elastomer indicated below, and of profile and hardness required to maintain watertight seal:
- a. Neoprene, ASTM C 864.
  - b. EPDM, ASTM C 864.
  - c. Silicone, ASTM C 1115.
  - d. Thermoplastic polyolefin rubber, ASTM C 1115.
  - e. Any material indicated above.



## 08000 - Doors & Windows

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- 2.5.3 Soft Compression Gaskets: Extruded or molded closed-cell, integral-skinned gaskets of material indicated below, complying with ASTM C 509, Type II, black, and of profile and hardness required to maintain watertight seal:
- a. Neoprene.
  - b. EPDM.
  - c. Silicone.
  - d. Thermoplastic polyolefin rubber.
  - e. Any material indicated above.
- 2.6 Miscellaneous Glazing Materials
- 2.6.1 General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials involved for glazing application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- 2.6.2 Cleaners, Primers and Sealers: Type recommended by sealant or gasket manufacturer.
- 2.6.3 Setting Blocks: Elastomeric material with a Shore A durometer hardness of 85 plus or minus 5.
- 2.6.4 Spacers: Elastomeric blocks or continuous extrusions with a Shore A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- 2.6.5 Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side-walking).
- 2.6.6 Plastic Foam Joint Fillers: Preformed, compressible, resilient, nonstaining, nonextruding, nonoutgassing, strips of closed-cell plastic foam of density, size, and shape to control sealant depth and otherwise contribute to produce optimum sealant performance.
- 2.7 Fabrication of Glass and Other Glazing Products
- 2.7.1 Fabricate glass and other glazing products in sizes required to glaze openings indicated, with edge and face clearances, edge and surface conditions, and bite complying with recommendations of product manufacturer and referenced glazing standard as required to comply with system performance requirements.
- 3.0 EXECUTION
- 3.1 Examination
- 3.1.1 Examine glass framing for compliance with the following:
- a. Manufacturing and installation tolerances, including those for size, squareness, offsets at corners.
  - b. Presence and functioning of weep system.
  - c. Minimum required face or edge clearances.
  - d. Effective sealing between joints of glass-framing members.



- 3.1.2 Do not proceed with glazing until unsatisfactory conditions have been corrected.
- 3.2 Preparation
- 3.2.1 Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings that are not firmly bonded to substrates.
- 3.3 Glazing, General
- 3.3.1 Comply with combined recommendations of manufacturers of glass, sealants, gaskets, and other glazing materials, except where more stringent requirements are indicated, including those in referenced glazing publications.
- 3.3.2 Glazing channel dimensions as indicated on Drawings provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.
- 3.3.3 Protect glass from edge damage during handling and installation as follows:
  - a. Use a rolling block in rotating glass units to prevent damage to glass corners. Do not impact glass with metal framing. Use suction cups to shift glass units within openings; do not raise or drift glass with a pry bar. Rotate glass lites with flares or bevels on bottom horizontal edges so edges are located at top of opening, unless otherwise indicated by manufacturer's label.
  - b. Remove damaged glass from Project site and legally dispose of off site. Damaged glass is glass with edge damage or other imperfections that, when installed, weaken glass and impair performance and appearance.
- 3.3.4 Apply primers to joint surfaces where required for adhesion of sealants.
- 3.3.5 Install elastomeric setting blocks in sill rabbets, sized and located to comply with referenced glazing standard, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- 3.3.6 Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- 3.3.7 Provide spacers for glass sizes larger than 50 united inches (1250 mm) (length plus height) as follows:
  - a. Locate spacers inside, outside, and directly opposite each other. Install correct size and spacing to preserve required face clearances, except where gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and comply with system performance requirements.
  - b. Provide 1/8-inch (3 mm) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- 3.3.8 Provide edge blocking to comply with requirements of referenced glazing publications, unless otherwise required by glass manufacturer.
- 3.3.9 Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- 3.3.10 Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.



## 08000 - Doors & Windows

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- 3.3.11 Square cut wedge-shaped gaskets at corners and install gaskets in manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.
- 3.4 Tape Glazing
  - 3.4.1 Position tapes on fixed stops so that when compressed by glass their exposed edges are flush with or protrude slightly above sightline of stops.
  - 3.4.2 Install tapes continuously but not in one continuous length. Do not stretch tapes to make them fit opening.
  - 3.4.3 Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
  - 3.4.4 Do not remove release paper from tape until just before each light is installed.
  - 3.4.5 Apply heel bead of elastomeric sealant.
  - 3.4.6 Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
  - 3.4.7 Apply cap bead of elastomeric sealant over exposed edge of tape.
- 3.5 Gasket Glazing (Dry)
  - 3.5.1 Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with stretch allowance during installation.
  - 3.5.2 Secure compression gaskets in place with joints located at corners to compress gaskets producing a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
  - 3.5.3 Install gaskets so they protrude past face of glazing stops.
- 3.6 Sealant Glazing (Wet)
  - 3.6.1 Install continuous spacers between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel weep systems until sealants cure. Secure spacers in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
  - 3.6.2 Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
  - 3.6.3 Tool exposed surfaces of sealants to provide a substantial wash away from glass. Install pressurized gaskets to protrude slightly out of channel to eliminate dirt and moisture pockets.
- 3.7 Lock-Strip Gasket Glazing
  - 3.7.1 Comply with ASTM C 716 and gasket manufacturer's printed recommendations. Provide supplementary wet seal and weep system unless otherwise indicated.
- 3.8 Protection and Cleaning



## 08000 - Doors & Windows

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- 3.8.1 Protect glass from contact with contaminating substances resulting from construction operations including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.
- 3.8.2 Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, including natural causes, accidents and vandalism, during construction period.
- 3.8.3 Wash glass on both faces in each area of Project not more than 4 days prior to date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer.

END OF SECTION 08750



## 08000 - Doors & Windows

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### SECTION 08810

#### GLASS AND GLAZING

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of glass and glazing materials. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.1 Tempered Glass
  - A. Herculite "K" - PPG Industries, Inc.
  - B. "Lustracrystal" (Tru-Temp) - AFG Industries., Kingsport, Tenn.
  - C. "Temper-Tuf" - Hamilton of Indiana
  - D. "Temper-Glas" - Virginia Glass Products
  - E. "Tuf-Flex" - Libbey-Owens-Ford.
- 1.1.2 Tempered Pattern - AFG Industries (Velvex, Industrex or Flax).
- 1.1.3 Polycarbonate
  - A. Rowland Polycarbonate - Rowland Prod. Inc., Conn.
  - B. Lexan Polycarbonate - General Electric, Pittsfield, Mass.
  - C. Merlon-Mobay Chemical Col., Pittsburgh, Pa.
- 1.1.4 One-Way Vision Panels

"Transparent Mirrorpane" on Tuf-Flex tempered plate 1/4-inch thick as manufactured by Libbey-Owens-Ford Glass Co., or Safe-Tee Glass Co., Philadelphia, Pa.
- 1.2 Identification:
  - A. Each sheet of tempered glass shall bear an "etched or sand blasted" label of the manufacturer.
  - B. All other glass shall bear the label of each sheet. Labels to remain until directed to be removed by the Contracting Officer.
- 1.3 Tests
  - 1.3.1 Test requirements shall conform to ANSI Z26.1 and as hereinafter modified.
    - A. Tempered glass shall withstand the impact of a one-half pound solid steel ball when dropped from a height of ten feet (10' - 0").
    - B. No more than one (1) in four (4) test specimens shall crack or break.



- C. When test specimens are broken as a result of impact test or by prick-punch, any ten (10) particles shall weigh not more than 1-1/2 ounces. Test specimens shall not be less than 12" x 12".
- D. When results of paragraphs above are negative, then the entire shipment will be rejected and the Contractor shall supply ALL NEW GLAZING for the project conforming to the specification requirements, at no additional cost to the Contracting Officer.

### 1.4 Samples

#### 1.4.1 Glass, Mirrors and Wall Mirrors

- A. Two (2) samples of each type and thickness.
- B. Each sample 5" by 8", bearing labels indicating manufacturer, type, quality, thickness and location.

#### 1.4.2 Glazing Compound

- A. Two (2) one pint samples.
- B. Each container must bear manufacturer's printed label indicating compliance with specifications.

### 1.5 Guarantee

- 1.5.1 The Contractor shall and does hereby, as part of the Contract, guarantee exterior glazing to be watertight and to remain so for a period of 2 years, after completion and acceptance, and agrees that he will repair at his own expense any leaks which may appear within that period of time.
- 1.5.2 In addition to the above, Manufacturer of Polycarbonate Glazing shall guarantee against breakage within five (5) years after completion and acceptance and agrees that he will replace at his own expense.

### 2.0 PRODUCTS:

- 2.1 Glazing Compounds and Preformed Glazing Sealants: A suitable type of glazing compound or preformed glazing sealant in compliance with Section Glazing Materials, of the FGMA Glazing Manual, shall be provided.

#### 2.1.1 Gunnable Polymer Glazing Sealants:

- 2.1.1.1 Acrylic (one-part): Fed. Spec. TT-S-230.
- 2.1.1.2 Butyl (one-part): Fed. Spec. TT-S-1657
- 2.1.1.3 Polysulfide (one or two-part): Fed. Spec. TT-S-230 and TT-S-227.
- 2.1.1.4 Polyurethane (one or two-part): Fed. Spec. TT-S-230 and TT-S-227.
- 2.1.1.5 Silicone (one-part): Fed. Spec. TT-S-1543 and TT-S-230.

#### 2.1.2 Glazing Preformed Tapes: Butyl or polyisobutylene/butyl, manufacturer's standards.

#### 2.1.3 Knife Grade Glazing Sealants:



## 08000 - Doors & Windows

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- 2.1.3.1 Wood Sash Putty: Fed. Spec. TT-P-00791. In original container and bearing brand and manufacturer's printed label.
- 2.1.3.2 Face Glazing Compound: Fed. Spec. TT-G-410 . Compound shall be in original containers bearing brand and manufacturer's printed label. For glazing of aluminum work compound shall be of aluminum color. Glazing compound and/or tape for Polycarbonate Glazing shall be in accordance with manufacturer/s of Polycarbonate Glazings recommendations.
- 2.1.3.3 Steel Sash Putty: Manufacturer's standard.
- 2.1.3.4 Channel Glazing Compound: Manufacturer's standard.
- 2.1.4 Gaskets for Glazing:
  - 2.1.4.1 Dense Neoprene: ASTM C 542 (lock-strip gaskets).
  - 2.1.4.2 Foam Neoprene: ASTM C 509
  - 2.1.4.3 PVC: ASTM D 2287
  - 2.1.4.4 Mullion Sections: Manufacturer's standard for glass size provided.
- 2.2 Glazing Accessories: Glazing points, chips, shims, angles, beads, setting blocks, spacer strips, and other glazing accessories shall be provided where required to provide a complete installation.
- 2.3 Float Glass: Federal Specification DD-G-451, Type I, Class 1, Quality q3.
- 2.4 Tempered Glass: Federal Specification DD-G-1403, Grade B, Style 1; Type I, Quality q3 or Type II, Quality q8. All tempered glass shall be purchased to meet field dimensions and shall not be altered in the field.
- 2.5 Wired Glass: Federal Specification DD-G-451, Type II, Class 1; Form I, diamond mesh, 1/4 inch thick and in compliance with ANSI Standard Z97.1. Wired glass for fire doors and windows shall comply with NFPA 80. Chicken wire will not be accepted.
- 2.6 Figured Glass: Federal Specification DD-G-451, Type II, Class 1; Form 3, Quality q8, 1/8 inch thick.
- 2.7 Rough Glass: Rolled, translucent, flat, glazing quality, one side rough and the other polished, 7/32 inch thick.
- 2.8 Laminated Glass: Laminated Glass shall be fabricated from two pieces of clear, heat-absorbing, light-reducing, or wired glass, as designated and previously specified, laminated together with a clear vinyl interlayer. Laminated glass shall comply with ANSI Z97.1.
- 2.9 Insulating Glass:
  - 2.9.1 Hermetically Sealed Glazing Units shall be fabricated of two lites of glass, separated by a dehydrated air space that is 1/2 inch unless otherwise designated and sealed permanently at the edges. Clear, light-reducing, heat-absorbing, figured, wired, and tempered glass shall be as previously specified.
  - 2.9.2 Manufacturer's Standard Fused-Glass Edge Construction shall use double-strength clear sheet glass and shall only be provided in small applications under 30 sq ft.
- 2.10 Mirror Glass: Plate or float glass complying with Fed. Spec. DD-G-451, Type I, Class I, Quality q2, and 1/4 inch thick except as otherwise indicated with a silver coating and protective electrolytic





copper coating not less than .0002 inch thick, complying with Fed. Spec. DD-M-411. The protection of the mirror back shall conform to Mil. Spec. DD-M-411.

### 2.11 Glazing Plastics:

2.11.1 Cast Acrylic Glazing Plastic Sheets of 1/4 inch thickness, of clear transparent acrylic plastic with a light transmittance of 92 percent for a 1/4-inch sheet, impact resistance to withstand a 16-foot drop of a 1/2-pound steel ball on a 12-inch x 12-inch x 1/4-inch edge-supported sheet, modulus of elasticity of approximately 450,000 psi, flexural strength of 16,000 psi and 180 degrees Fahrenheit allowable continuous service temperature.

2.11.2 Cast Polycarbonate Glazing Plastic Sheets of 1/4-inch thickness of clear transparent polycarbonate plastic, with a minimum light transmittance of 82 percent for a 1/4-inch sheet and free of significant dimensional change for exterior exposure. Drop ball impact resistance of 200 foot-pounds, for a 12-inch x 12-inch x 1/8-inch edge-supported sheet, modulus of elasticity of 340,000 psi, flexural strength of 13,500 psi, and 250 degrees Fahrenheit allowable continuous service temperature.

2.11.3 Reinforced Polyester Glazing Plastic Sheets of 1/8-inch thickness of clear translucent acrylic-modified polyester plastic sheet with invisible glass fiber reinforcement compounded specifically for exterior exposure with UV absorbers with a light transmittance of 92 percent for an 1/8-inch sheet, manufacturer's standard figured or textured surfaces, a modulus of elasticity of 721,000 psi, flexural strength of 17,800 psi, and 180 degrees F. allowable continuous service temperature.

2.11.4 Reinforced Polyvinyl Chloride Sheets of 0.12 inch thickness of clear transparent rigid polyvinyl chloride with .011-inch galvanized steel mesh woven to 10 mesh screening and located in the center of the sheet thickness. The sheet shall have a light transmission of 85 percent for a 1/4-inch sheet, tensile strength of 8,500 psi, flexural modulus of 550,000 psi, and flexural strength of 15,000 psi.

2.12 Bullet-Resisting Glass: Glass shall be fabricated from Type I, Class I, Quality q3 glass with polyvinyl butyral plastic interlayers between the layers of glass. The thickness of each layer of glass shall be in accordance with the manufacturer's standard practice. The total nominal thickness of the laminated glass shall be 1-3/16-inches. Glass shall meet the test requirements of the Underwriters' Laboratory for bullet-resisting materials. Listing in Underwriters' Laboratory Guide COGT will be accepted as evidence of compliance with this requirement in lieu of a certificate.

2.13 One-Way Vision Glass: Glass shall be fabricated from Type I, Class I, Quality q2, 1/4-inch thick glass. One face shall be coated with a hard adherent film of chromium or other approved coating of proven equivalent durability. The glass shall transmit not less than 5 percent or more than 11 percent of total incident light in the visible region and shall reflect from the front surface of the coating not less than 45 percent of the total incident light in the visible region.

2.14 Spandrel Glass: Fed. Spec. DD-G-1403, Grade A, Style II, Type I, Quality q5.

2.15 Reflective Glass: Fed. Spec. DD-G-1403, Grade A or B, Style III, Type I, Quality q3, with minimum 10 percent visible light transmission and maximum 25 percent solar energy transmittance.

### 2.16 Aluminum Windows:

2.16.1 All units (except where insulated panels are required for installation) shall be pre-glazed at the factory.

2.16.2 All sash shall be constructed to glaze an overall minimum thickness of 3/16 inch Margard polycarbonate as manufactured by GE Lexan.



## 08000 - Doors & Windows

- 2.16.3 Each sash shall replicate the muntin configuration of the original windows. Each polycarbonate lite shall be glazed into the new aluminum muntins separately, no applied grids will be acceptable.
- 2.16.4 All units shall be inside bead glazed. Marine type glazing will not be acceptable.
- 2.16.5 Insulated Panels: 1"(one inch) total thickness with factory acrylic enamel exterior and interior smooth aluminum skins to match window frame finish. Provide tempered hardboard substrate and 1/7/ct density urethane core. Install panels in accordance with manufacturer's recommendations.
- 2.16.6 All glazing shall be clear, with the exception of glazing work at toilets, store rooms, and similar locations where glazing shall be obscure, in compliance with paragraphs of Standard Section 13-Glass and Glazing.
- 2.16.7 New clear glazing shall be Lexan MR5 extruded polycarbonate glazing sheet; new obscure glazing shall be Lexan Protect-a-glaze. Both clear and obscure glazing shall be as manufactured by General Electric Co., of Mount Vernon, Indiana, or approved equal, installed following manufacturer's printed instructions. Thickness of glazing edge engagement and expansion allowance shall be as follows:

<u>Short Glazing Dimension</u>	Up to 24"	24-36"	36"-48"	48"-60"	60"-72"	72"-96"	96"-120"
<u>Thickness</u>	3/16"	1/4"	3/8"	1/2"	1/2"	1/2"	1/2"
<u>Edge Engagement</u>	5/16"	1/2"	5/8"	3/4"	7/8"	1"	1-1/4"
<u>Expansion Allowance</u>	1/16"	1/8"	3/16"	1/4"	5/16"	3/8"	

### Notes:

- a. Edge engagement guide lines pertain to all four sides of sash.
  - b. Where the size of the window opening exceeds the glazing recommendations for Lexan thickness, glass shall be installed.
- 2.16.8 Labels: Each light of glazing shall bear the manufacturer's marking, identifying the kind of quality of glazing. Marking shall be removed prior to installation of sash at the site.
- 2.16.9 Protection: All window glazing shall be protected in strict accordance with manufacturer's recommendations.
- 3.0 EXECUTION:
- 3.1 Preparation: Preparation of glazing and surrounding area shall comply with the details and general conditions governing glazing in the FGMA Glazing Manual unless otherwise specified.
- 3.1.1 Glazing: Remove broken glazing and putty from frames.
- 3.1.2 Frames: Clean existing frames. Replace missing or inoperative gaskets and glazing beads.
- 3.2 Installation:
- 3.2.1 General: The Contractor shall determine glazing dimensions by measuring the actual opening to receive the glass. Install sheet glass with the visible lines or waves running with the horizontal dimensions. Leave labels in place until the installation is approved.
- 3.2.2 Glass Setting: Items shall be glazed using glass of the quality and thickness specified or indicated. Doors and windows may be glazed in compliance with one of the glazing methods described in the



## 08000 - Doors & Windows

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standards under which they are produced, except the face puttying method illustrated and described in ANSI A2000.1 will not be permitted.

- 3.2.3 Wired Glass: Install wire glass for fire doors and fire windows in compliance with the requirements of NFPA No. 80.
- 3.2.4 Cleaning: Glass surfaces shall be thoroughly cleaned, with labels, paint spots, putty, and other defacements removed and shall be clean at the time the work is accepted.

END OF SECTION 08810



## SECTION 08900

### FINISH AND SECURITY HARDWARE

- 1.01 DESCRIPTION: This specification covers the furnishing and installation of finish and security hardware. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.02 REFERENCED DOCUMENTS: Industry Standards
- A. American National Standards Institute (ANSI): A117.1, Buildings and Facilities Accessibility to and Usability by Physically Handicapped People
  - B. Building Hardware Manufacturer's Association (BHMA)
    - 1. A156.13 Mortise Locks and Latches
    - 2. 156.3 Exit Devices
    - 3. 156.18 Materials and Finishes
  - C. Door and Hardware Institute (DHI): Recommended Locations for Builders' Hardware
- 2.0 PRODUCTS
- 2.01 BUTT HINGES: Full mortise, 4-1/2 inches by 4-1/2 inches, (brass US26D finish) (stainless steel US32D finish) (except "H5" and "H6"), and have flat button tips. Identified as:
- A. "H1": Standard weight; have two ball bearings and be either Hager's BB1191, McKinney's TB2314, Soss' SS450TBB, or Stanley's FBB191.
  - B. "H2": Heavy weight; have four ball bearings and be either Hager's BB1199, McKinney's T4B3386, Soss' SS4B450TBB, or Stanley's FBB199.
  - C. "H3": Standard weight; have two ball bearings, and nonremovable pin (NRP); and be either Hager's BB1191, McKinney's TB2314, Soss' SS450TBB, or Stanley's FBB191.
  - D. "H4": Heavy weight; have four ball bearings, and nonremovable pin (NRP); and be either Hager's BB1199, McKinney's T4B3386, Soss' SS4B450TBB, or Stanley's FBB199.
  - E. Electric butts "H5"
    - 1. Single signal-carrying hinge on a door leaf.
    - 2. Brass or bronze having US26D chromium finish.
    - 3. Same manufacturer and hinge type as other hinges specified for that door leaf.
    - 4. One of the following types: Hager's ETM, Stanley's CE, or McKinney's CC.
  - F. "H6": Standard weight; steel with two ball bearings, nonrising pin, and USP finish; and be either Hager's BB1279, McKinney's TB3713, Soss' SS450TBB, or Stanley's FBB179.



## 08000 - Doors & Windows

- 2.02 SPECIAL HINGES: "H7", five inches by five inches, heavy weight, security type designed for field welding; galvanized finish primed for painting; and be either Hager's 1850 or McKinney's 706.
- 2.03 LOCKSETS: Heavy duty, mortise type conforming to BHMA A156.13; strike, scalp, sectional trim, 2-3/4 inch backset, armored front adjustable from flat to bevel of 1/8 inch in two inches, latch bolt having a throw of not less than 1/2 inch, deadbolt throw not less than one inch, fasteners, and a concealed screw or screwless rose. Lever handle and rose; cast or wrought stainless steel with two-, 2-1/4-, or 2-3/8 inch diameter rose, and have US32D finish unless otherwise indicated. Lockset cylinder construction cores shall be manufactured by Best Lock Corp. Cylinders shall have cams designed for lockset in which cams will be installed; construction cores shall be keyed to the Construction Master Key System. Identified as:
- A. "LK1": Corbin's 779L-9557, Russwin's 5059L L2 Lustra, Sargent's 8104LNH, Yale's CRR8705FL, or Schlage's L9080 03A.
  - B. "LK2": Corbin's 779L-9520 x EK x WBS, Russwin's 5039L L2 Lustra x EK x WBS, Sargent's 8165 LNH x EK x WBS, Yale's CRR8702FL x EK x WBS, or Schlage's L9040 03A x EK x SBS.
  - C. "LK4": Sargent's 8150LNH.
  - D. "LK5": Corbin's 779L-9555 x WBS, Russwin's 5045 L2 Lustra x WBS, Sargent's 8137LNH x WBS, Yale's CRR8708FL x WBS, or Schlage's L9070 03A x WBS.
  - E. "KS5": Electric switch lock; Best Lock Corp.'s 1W6G4 (Exterior, Surface Mounted) 125 V.A.C. x 15 AMP x 32D.
  - F. "KS6": Electric switch lock; Best Lock Corp's 1W6H4 (Interior, Recessed) x 125 V.A.C. x 15 AMP x 32D having Leviton No. 4925 waterproof cover.
- 2.04 LATCHSETS: Identified as "L"; heavy duty, mortise type conforming to ANSI A156.13; have strike, scalp, 2-3/4 inch backset, fasteners, and a concealed screw or screwless rose. Lever handle and rose; cast or wrought stainless steel with two-, 2-1/4-, or 2-9/16-inch diameter rose, and have US32D finish unless otherwise indicated. Latchsets shall be either Corbin's 779L-9510 x WBS, Russwin's 5025L L2 Lustra x WBS, Sargent's 8115LNH x WBS, Yale's CRR8701FL x WBS, or Schlage's L9010 03A x WBS.
- 2.05 DUMMY TRIM: Identified as "DT"; conform to BHMA A156.13; have 2-3/4 inch backset, fasteners, and either a concealed screw or screwless rose. Knobs: cast or wrought stainless steel with two-, 2-1/4-, or 2-3/8 inch diameter rose, and have US32D finish unless otherwise indicated. Dummy trim shall be either Corbin's 779L2DT, Russwin's 2-1/2 D3774L2 Lustra, Sargent's 8194LNH, Yale's CRR838B, or Schlage's L90172 03A x WBS.
- 2.06 DEAD LOCKS: Identified as
- A. "DL1": Single cylinder type having US32D finish unless otherwise indicated; cylinder and core manufactured by Best Lock Corp.; cylinder cams shall be designed for dead lock; either Corbin's 9511 x WBS, Russwin's 5001 x WBS, Sargent's 7720 x WBS, Yale's 8714 x WBS, or Schlage's L9464 x WBS. Fit cylinder with "MB" construction core keyed to the Construction Master Key System.
  - B. "DL2": Double cylinder type having US32D finish unless otherwise indicated; cylinder and core manufactured by Best Lock Corp.; cylinder cams designed for dead lock; either Corbin's 9512 x



## 08000 - Doors & Windows

WBS, Russwin's 5002 x WBS, Sargent's 7722 x WBS, Yale's 8714-2 x WBS, or Schlage's L9462 x WBS. Fit cylinder with "MB" construction core keyed to the Construction Master Key System.

- 2.07 PADLOCKS: Identified as "PL"; cylinder and core manufactured by Best Lock Corp.; cylinder cams designed for padlock; Best Lock Corp.'s 6B772-M3. Fit cylinder with "MB" construction core keyed to the Construction Master Key System.
- 2.08 MORTISE LOCK CYLINDERS: Cylinders for locksets having US32D finish shall have US26D finish; other cylinders shall have US10B finish. Identified as:
- A. "LC1": Best Lock Corp.'s 1E74 x 26D with Cylinder Ring 1ER7.
  - B. "LC4": Sargent's Keso No. 172x26D.
  - C. "LC5": Best Lock Corp.'s 1E74 x 10B with Cylinder Ring 1ER7 x 10B.
- 2.09 RIM LOCK CYLINDERS: Cylinders for locksets or panic exit devices having US32D finish shall have US26D finish; other cylinders shall have US10B finish. Identified as
- A. "LC2": Best Lock Corp.'s 1E72 with Cylinder Ring 1ER7.
  - B. "LC3": Sargent's Keso No. 164x26D modified for key switch installation with Security Switch SS4.
- 2.10 PANIC EXIT DEVICES: Rim type and bar operated conforming to BHMA 156.3, UL-labeled for "Accident Hazard", UL-labeled for 1-1/2 hour fire rating, adjustable strike, stainless steel, and have US32D finish. Identified as:
- A. "PD1": Von Duprin's 88NL-F less cylinder or Sargent's 12-9804 x PTB x 32D.
  - B. "PD2": Have panic device touch bar sign "EMERGENCY EXIT-ALARM WILL SOUND" in 1-1/2 inch letters etched into touch bar and filled with red enamel; Von Duprin's 33EO without outside trim and cylinder and with US28 finish except US32D finish on touch bar, or Sargent's 6510 x 32D.
  - C. "PD3": Von Duprin's 3347EO-F on inactive leaf and 3347L-Fx20 without cylinder on active leaf, US28 finish except US32D finish on touch bar; or Sargent's 12-6410 x 32D x 12-6413 x 713 ETH Aux. Control x less cylinder x 32D.
  - D. "PD4": Von Duprin's 3347L-F x 20 or Sargent's 12-6413 x 713 ETH x less cylinder x 32D.
  - E. "PD5": Von Duprin's 3327EO x 26D or Sargent's 6710 x 32D.
- 2.11 AUTOMATIC FLUSH BOLTS: Identified as "AFB"; brass having US26D finish, have 3/4 inch bolt throw, and be UL listed; Ives' No. 559 or Glynn-Johnson's FB9.
- 2.12 REMOVABLE MULLION: Identified as "RM"; with top plate applied to metal stop and bottom plate applied to metal threshold; Corbin's 0568 or Von Duprin's 9954.
- 2.13 OVERHEAD STOPS AND HOLDERS: Identified as "OH"; have bronze arms and channels and US26D finish, and be nonhanded and either surface-mounted or concealed type; Glynn-Johnson's GJ330 Series for doors not wider than four feet and GJ 79 HD for doors wider than four feet, or accepted equivalent.



## 08000 - Doors & Windows

- 2.14 DOOR BUMPERS: Identified as "ST1": wrought stainless steel; convex rubber; and have US32D finish, machine screws, and lead expansion shields; Ives' 408, Quality's W307-S, or Builders Brass Works Corp.'s W12X.
- 2.15 DOOR STOPS: Identified as "ST2": cast brass, solid rubber bumper, and have US4 finish, machine screws, and lead expansion shields; Ives' 436, Quality's 331-ES, or Builders Brass Works Corp.'s F8061X.
- 2.16 DOOR STOP AND HOLDERS: Identified as "ST3"; brass, and have rubber bumpers and US4 finish; and be either Baldwin's 4096 or Quality's 137.
- 2.17 PUSH PLATES: Identified as "PP1"; be stainless steel, and eight inches by 16 inches by 16 gauge; have US32D finish; and be either Baldwin's 2125, Builders Brass Works Corp.'s No. 47, or Quality's 40.
- 2.18 PULL PLATES: Identified as "PP2"; be stainless steel having four-inch by 16-inch by 16 gauge plate; have US32D finish; and be either Baldwin's 2407, Builders Brass Works Corp.'s No. 47 x 290, or Quality's 4110.
- 2.19 KICK PLATES: Identified as "KP"; be stainless steel, and two inches less than door width by eight inches by 0.05 inch thick; with US32D finish; Baldwin's 2000, Builders Brass Works Corp.'s 37 Series, or Quality's 48.
- 2.20 MOP PLATES: Identified as "MP"; be stainless steel, and one inch less than door width by eight inches by 0.05 inch thick; with US32D finish; Baldwin's 2000, Builders Brass Works Corp.'s 37 Series, or Quality's 48.
- 2.21 DOOR PULLS: Identified as "DP" for use on dwarf doors only; cast brass or bronze; overall size six-inch by 1-3/4 inch by 1-3/8 inch projection; Ives' 410 B26D.
- 2.22 FLUSH BOLTS: Identified as "FB1"; brass, and have 6-3/4 inch by one inch rectangular front, US26D finish, mortised dust-proof strike having lead anchors, bottom bolt 12 inches long, and top bolt 12 inches long except 24 inches for eight-foot high doors; and be either Baldwin's 0600, Quality's 1358, Door Controls' 840, or Ives' 458B26D.
- 2.23 SURFACE BOLTS: Identified as
- A. "SB": Eight inches long; Baldwin's 0330 x 26D, Glynn-Johnson's GR 1642 x 26D, or Ives' 453F26D.
  - B. "SB1": Three inches long; Ives' 88B26D.
  - C. "CB": Richards-Wilcox No. 524-P23; Stanley's 1010x24, Hager's 1408x24, or Lawrence Brothers' 250x24. Furnish stainless steel sex bolts for door mounting. Finish shall be manufacturer's standard.
  - D. "CH-B": Designed for surface-mounting on inactive leaf with machine screws. Richards-Wilcox's No. 514-P36 housing, heavy steel, nine inches long; bolt proper 3/4 inch wide by 1/4 inch thick, 10 inches long overall; strike and keepers; double chain length with ring on end. Finish: gray enamel.
- 2.24 HASPS
- A. Safety hasps: Identified as "SH"; Hager's WS1915 or accepted equivalent.





## 08000 - Doors & Windows

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- B. Hinge hasps: Identified as "HH"; Hager's WS1941 or accepted equivalent.
- 2.25 DOOR COORDINATORS: Identified as "DC"; UL-listed, rated as indicated, and sized to suit door opening; Glynn-Johnson's COR Coordinator or Ives' Door Coordinators. Furnish frame filler.
- 2.26 DOOR SILENCERS: Identified as "SC"; gray rubber; either Baldwin's 4035, Glynn-Johnson's GJ 64, or Quality's 1337 A.
- 2.27 WEATHERSTRIP FOR HEAD AND JAMBS: Identified as "WS"; clear anodized extruded aluminum having neoprene or rubber gaskets; either National Guard Products, Inc.'s 11ONS, Pemko's 332AR, or Reese's DS69.
- 2.28 AIR SEALS FOR HEAD AND JAMBS: Identified as "AIR"; top grade silicon rubber; self-adhering; either Stanley's Double Guard 5050 Series or Pemko's Siliconseal. Color shall be brown unless otherwise indicated.
- 2.29 AUTOMATIC DOOR BOTTOMS: Identified as "ADB"; surface-mounted type; extruded aluminum having either neoprene or rubber gaskets; either National Guard Products, Inc.'s 420, Pemko's 430AS, or Reese's 330.
- 2.30 THRESHOLDS: Notched at jambs; either abrasive cast or extruded aluminum having clear anodized finish, length equal to that of opening width.
- A. Identified as "TH": have vinyl insert; National Guard Products, Inc.'s 883VxL/S, Pemko's 181AVxL/S, or Reese's S488AVxL/S.
- B. Identified as "TH1": Have neoprene insert; National Guard Products, Inc.'s 885N, or accepted equivalent.
- C. Identified as "TH2": Barrycraft Construction Casting Co.'s Style B1155.
- D. Identified as "TH3": Either Reese Enterprises, Inc.'s S803A or National Guard Products, Inc.'s 413ALUM.
- 2.31 REGULAR DOOR CLOSERS: Narrow projection, surface-mounted type with nonferrous cover, with high strength cast iron cylinder having full rack and pinion hydraulic operation, constant viscosity fluid, and noncritical and independent tamper-proof regulating screws for adjusting latch speed, general speed, and backcheck; and nonhanded accessories. Spring shall be adjustable from size two through size six. Drop plates, mounting plates, shoe spacers, and angle brackets shall be manufacturer's standard. Closer cover and exposed parts shall have sprayed aluminum finish; undercoat closer arm and body with special rust inhibitor. Identified as:
- A. "RDC1": LCN Closers' 4040-Cush x SNB.
- B. "RDC2": LCN Closers' 4040 regular arm mounting.
- C. "RDC3": LCN Closers' 4040H regular arm mounting.
- D. "RDC4": LCN Closers' 4040 EDA x parallel arm mounting.
- E. "RDC5": LCN Closers' 4040H-Cush x SNB.
- F. "RDC6": LCN Closers' 4040 DEL regular arm mounting.
- G. "RDC7": LCN Closers' 4040 EDA-DEL x parallel arm mounting x SNB.





## 08000 - Doors & Windows

- 2.32 GATE CLOSERS: Identified as "GC2"; designed to be concealed in floor, and have cast iron base, compression spring, swing speed adjustment, sealed case, and cold weather fluid; and be Rixson-Firemark's SC2890xC.W.F.xSP Layout 524 x US26D x US32D cover plate x 1/4 inch clearance.
- 2.33 HARDWARE FASTENERS: Provide all fasteners necessary for securing hardware items in designated locations. Fastener finish shall match item installed and be compatible and non-reactive with substrate or item installed.
- 2.34 SECURITY HARDWARE: Switches, strikes, push buttons, and alarms shall have hook-up lead slack, within junction box, not shorter than five inches.
  - A. Door position switch
    - 1. Mortised: "SH1"; Detex Corp.'s Model No. MS-2049Fx24V DC, or accepted equivalent.
    - 2. Surface: "SH2"; Detex Corp.'s Model No. MS-2049Sx24V DC, or accepted equivalent.
    - 3. Semi-mortised: "SH8"; Detex Corp.'s Model No. EA-428x24V DC, or accepted equivalent.
  - B. Electric strike: Identified as
    - 1. "SH3": Folger Adam Co.'s 310-2 x 24-Volt DC x LCM x US32D.
    - 2. "SH4": Folger Adam Co.'s 310-3x24VDCxLCMx US32D.
  - C. Monitor strike: Identified as "SH5"; Von Duprin's 4263T1.
  - D. Exit alarm: Identified as "SH6"; Detex Corp.'s Model No. EA-2504-AC with Detex Corp.'s transformer PP-5152-Z.
  - E. Security coverplate: Identified as "SH9"; Precision Hardware, Inc.'s Lockguard No. 1625xUS32D, Ives' Lockguard No. 180 x 32D, or Glynn-Johnson's Lock Protector LP-1.
- 2.35 KEY-OPERATED SECURITY SWITCHES: Identified as "SS4": maintained-contact operation, momentary-contacts (spring-return) operation, all contacts double pole, double throw; Best Lock Co.'s 1W7G4 (exterior installation) or 1W6H4 (interior installation) for 24-Volt DC operation with rim cylinder LC3.
- 2.36 PERMANENT CORES: Keyed as specified, have US15 finish, and be Best Lock Corp.'s Figure 8. Key permanent Keso cores to the Authority's existing Keso system. Request for keying information shall be made in writing to the Authority, who will then arrange for a meeting with Authority's keying representative.
- 2.37 HARDWARE CLEANSERS: As recommended by the several respective hardware manufacturers.
- 2.38 HARDWARE LUBRICANTS: As recommended by the several respective hardware manufacturers.
- 3.0 EXECUTION
  - 3.01 INSPECTION: Inspect surfaces to which hardware will be applied for conditions adversely affecting installation and operation of hardware.
  - 3.02 PRELIMINARY WORK: Eliminate conditions adversely affecting installation and operation of hardware.
  - 3.03 INSTALLATION



## 08000 - Doors & Windows

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- A. Install finish hardware to template, flush, and true-to-line; plumb vertical lines and level horizontal lines. Install hardware in accordance with hardware manufacturers' printed installation instructions. Position hardware in accordance with the DHI "Recommended Locations for Builders' Hardware".
  - B. Cut and fit to substrate to prevent damage to, and weakening of, substrate. Cover cut-outs with hardware. Mortise without gouging of, and irregularities in, exposed finish work.
  - C. If surfaces on and through which hardware will be installed will be painted or otherwise finished, fit and completely adjust hardware, remove hardware before finishing, and place hardware in original packaging. Reinstall hardware after finishing.
  - D. Anchor thresholds with flat-head screws fitted into lead expansion shields installed in floor. Screws: countersunk. Fill underside of threshold with either waterproof grout, butyl rubber sealant, or polyisobutylene mastic to fill concealed voids; remove excess material.
  - E. Anchor door stops with flat-head machine screws fitted into lead expansion shields. Screws shall be not shorter than 2-1/2 inches.
  - F. Coordinate door position switches with direction of door opening; install switches on secure side of door.
- 3.04 ELECTRICAL CONNECTIONS: Connect and test all signal and activating devices with their respective systems.
- 3.05 ADJUSTING: Hardware shall operate smoothly and without binding at time of Final Inspection.
- A. Adjust installed hardware having moving parts in a manner which will ensure that hardware will perform its intended function smoothly and without binding. Apply lubricant to moving parts.
  - B. Readjust and lubricate hardware requiring readjusting and lubricating.
  - C. Adjust door closers in accordance with ANSI A117.1.
- 3.06 CLEANING: Remove defective hardware, and either repair or replace with new hardware. Clean hardware immediately before Substantial Completion Date in accordance with hardware manufacturers' printed cleaning instructions.



### 3.07 HARDWARE SCHEDULE

#### Set No. 1

1-1/2 pair	Butt hinge H1 (H3 if regular-bevel door)
1 each	Cylinder LC1 (if door finish is clear anodized aluminum)
1 each	Cylinder LC5 (if door finish is dark bronze)
1 each	Regular door closer RDC1
1 each	Panic exit device PD4 (Omit if door will not serve as an emergency exit)
Remainder of hardware by storefront door manufacturer	

#### Set No. 2

1-1/2 pair	Butt hinge H1
1 each	Cylinder LC2
1 each	Panic exit device PD1
1 each	Regular door closer RDC1
3 each	Silencer SC
1 set	Weatherstrip WS
1 each	Threshold TH

#### Set No. 3

3 pair	Butt hinge H1
1 each	Cylinder LC1
1 set	Panic exit device PD3 (divergent bevels on doors required; no overlapping astragal)
2 each	Regular door closer RDC1 (Omit if 180-degree swing is not required)
2 each	Regular door closer RDC4 (Omit if 180-degree swing is required)
4 each	Silencer SC
2 each	Door bumper ST1 (if wall-mounted) (Omit if RDC1 is used)
2 each	Door stop ST2 (if floor-mounted) (Omit if RDC1 is used)
1 set	Weatherstrip WS
1 each	Threshold TH (Use TH1 if there is a drop in floor elevation to exterior)

#### Set No. 4

1-1/2 pair	Butt hinge H1
1 each	Cylinder LC2
1 each	Panic exit device PD1
1 each	Regular door closer RDC1 (if 180-degree swing is not required)
1 each	Regular door closer RDC4 (if 180-degree swing is required)
3 each	Silencer SC
1 each	Door bumper ST1 (if wall-mounted) (Omit if RDC1 is used)
1 each	Door stop ST2 (if floor-mounted) (Omit if RDC1 is used)

#### Set No. 5

3 pair	Butt hinge H1
2 each	Cylinder LC1
2 set	Panic exit device PD3 (divergent bevels on doors required; no overlapping astragal)



## 08000 - Doors & Windows

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2 each	Regular door closer RDC1 (if 180-degree swing is not required)
2 each	Regular door closer RDC4 (if 180-degree swing is required)
4 each	Silencer SC
2 each	Door bumper ST1 (if wall-mounted) (Omit if RDC1 is used)
2 each	Door stop ST2 (if floor-mounted) (Omit if RDC1 is used)

Set No. 6	
1-1/2 pair	Butt hinge H1
1 each	Lockset LK1
1 each	Cylinder LC1
1 each	Regular door closer RDC1
3 each	Silencer SC
1 set	Weatherstrip WS
1 each	Threshold TH (Use TH1 if there is a drop in floor elevation to exterior)

Set No. 7	
4 pair	Butt hinge H1
1 each	Lockset LK1
1 each	Cylinder LC1
2 each	Flush bolt FB1 (on inactive leaf)
2 each	Regular door closer RDC1 (only one closer for active leaf if door not labeled)
1 each	Door coordinator DC (omit if only one closer)
1 set	Weatherstrip WS
1 each	Threshold TH (Use TH1 if there is a drop in floor elevation to exterior)
4 each	Silencer SC

Set No. 8	
1 each	Cylinder LC1
1 each	Padlock PL (if manual operation; omit if motorized operation)
Remainder of hardware described in Section for appropriate door	

Set No. 9 - when inactive leaf of door is not required as an exit.

3 pair	Butt hinge H1
1 each	Panic exit device PD1
1 each	Cylinder LC2
1 each	Door coordinator DC
1 each	Automatic flush bolt AFB
2 each	Regular door closer RDC1
4 each	Silencer SC
2 each	Kick plate KP
1 set	Weatherstrip WS
1 each	Threshold TH

Set No. 10	
1-1/2 pair	Butt hinge H1
1 each	Cylinder LC2
1 each	Panic exit device PD1



## 08000 - Doors & Windows

1 each	Regular door closer RDC1
3 each	Silencer SC
1 set	Weatherstrip WS
1 each	Threshold TH
Set No. 11	
3 pair	Butt hinge H1 (4 pair if 8'-0 high door)
2 each	Panic exit device PD1
2 each	Cylinder LC2
2 each	Regular door closer RDC1
1 each	Removable mullion RM
4 each	Silencer SC
2 each	Weatherstrip WS
2 each	Threshold TH
Set No. 12	
1-1/2 pair	Butt hinge H1
1 each	Cylinder LC2
1 each	Panic exit device PD1
1 each	Regular door closer RDC1
3 each	Silencer SC
1 each	Kick plate KP
Set No. 13	
3 pair	Butt hinge H1
2 each	Panic exit device PD4
2 each	Panic exit device PD5 (if exterior door from trackway)
1 each	Cylinder LC5 (Omit if there will be a PD5)
2 each	Kick plate KP (Omit if there will be a PD5)
2 each	Mop plate MP (Omit if there will be a PD5)
2 each	Regular door closer RDC1 (no overlapping astragal)
4 each	Silencer SC
Set No. 14	
1-1/2 pair	Butt hinge H1
1 each	Lockset LK1
1 each	Cylinder LC1
1 each	Regular door closer RDC1 (if reverse-bevel door is required and 180-degree swing is not required)
1 each	Regular door closer RDC2 (if regular-bevel door is required)
1 each	Regular door closer RDC4 (if reverse-bevel door is required and 180-degree swing is required)
3 each	Silencer SC
1 each	Door bumper ST1 (if wall-mounted)
1 each	Door stop ST2 (if floor-mounted)
1 each	Kick plate KP



## 08000 - Doors & Windows

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### Set No. 15

3 pair	Butt hinge H1 (H3 if regular-bevel door)
1 each	Lockset LK1
1 each	Cylinder LC1
1 each	Regular door closer RDC1 (if reverse-bevel door is required and 180-degree swing is not required)
1 each	Regular door closer RDC2 (if regular-bevel door is required)
1 each	Regular door closer RDC4 (if reverse-bevel door is required and 180-degree swing is required)
2 each	Flush bolt FB1 (on inactive leaf)
4 each	Silencer SC
2 each	Kick plate KP
2 each	Mop plate MP
2 each	Door bumper ST1 (if wall-mounted) (Omit if RDC1 is used)
2 each	Door stop ST2 (if floor-mounted) (Omit if RDC1 is used)

### Set No. 16

1 1/2 pair	Butt hinge H2
1 each	Deadlock DL2
1 each	Cylinder LC1
1 each	Regular door closer RDC2
1 each	Push plate PP1
1 each	Pull plate PP2
3 each	Silencer SC
1 each	Mop plate MP
1 each	Kick plate KP
1 each	Door bumper ST1 (if wall-mounted)
1 each	Door stop ST2 (if floor-mounted)

### Set No. 17: Telephone closet

1-1/2 pair	Butt hinge H3 (H1 if reverse-bevel door)
1 each	Lockset LK1
1 each	Cylinder LC1
1 each	Overhead control OH (if reverse-bevel door is required)
3 each	Silencer SC
1 each	Door bumper ST1 (if wall-mounted) (Omit if exterior door)
1 each	Door stop ST2 (if floor-mounted) (Omit if exterior door)

### Set No. 18: Custodial room

1-1/2 pair	Butt hinge H4 (H2 if reverse bevel door)
1 each	Lockset LK1
1 each	Cylinder LC1
1 each	Regular door closer RDC1 (if reverse-bevel door is required and 180-degree swing is not required)
1 each	Regular door closer RDC2 (if regular-bevel door is required)
1 each	Regular door closer RDC4 (if reverse-bevel door is required and 180-degree swing is required)



## 08000 - Doors & Windows

3 each	Silencer SC
1 each	Door bumper ST1 (if wall-mounted) (Omit if RDC1 is used)
1 each	Door stop ST2 (if floor-mounted) (Omit if RDC1 is used)
1 each	Kick plate KP
1 each	Mop plate MP (Omit if exterior and reverse-bevel door)
1 set	Weatherstrip WS (if exterior door)

### Set No. 19: Trash room

1-1/2 pair	Butt hinge H4 (H2 if reverse-bevel door)
1 each	Lockset LK1
1 each	Cylinder LC1
1 each	Regular door closer RDC2 (if reverse-bevel door, use RDC1)
3 each	Silencer SC
1 each	Kick plate KP
1 each	Mop plate MP (Omit if exterior and reverse-bevel door)
1 each	Door bumper ST1 (if wall-mounted)(Omit if RDC1 is used)
1 each	Door stop ST2 (if wall-mounted)(Omit if RDC1 is used)

### Set No. 20

1-1/2 pair	Butt hinge H3 (H1 if reverse-bevel door)
1 each	Lockset LK1
1 each	Cylinder LC1
1 each	Kick plate KP
1 each	Mop plate MP
1 each	Regular door closer RDC1 (if reverse-bevel door is required and 180-degree swing is not required)
1 each	Regular door closer RDC2 (if regular-bevel door is required)
1 each	Regular door closer RDC4 (if reverse-bevel door is required and 180-degree swing is required)
3 each	Silencer SC
1 each	Door bumper ST1 (if wall-mounted) (Omit if RDC1 is used)
1 each	Door stop ST2 (if floor-mounted) (Omit if RDC1 is used)

### Set No. 21

1 1/2 pair	Butt hinge H6
1 each	Lockset LK5
1 each	Cylinder LC1
1 each	Regular door closer RDC2
3 each	Silencer SC
1 each	Door bumper ST1 (if wall-mounted)
1 each	Door stop ST2 (if floor-mounted)
1 each	Kick plate KP
1 each	Mop plate MP

### Set No. 22

1-1/2 pair	Butt hinge H3
1 each	Latchset L



## 08000 - Doors & Windows

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1 each	Overhead control OH (if reverse-bevel door is required)
3 each	Silencer SC
1 each	Door bumper ST1 (if wall-mounted)
1 each	Door stop ST2 (if floor-mounted)
1 each	Mop plate MP

### Set No. 23

3 pair	Butt hinge H3
1 each	Latchset L
2 each	Surface bolt SB (top and bottom)
4 each	Silencer SC
2 each	Door bumper ST1 (if wall-mounted)
2 each	Door stop ST2 (if floor-mounted)
2 each	Door stop ST3
2 each	Mop plate MP

### Set No. 24

1 1/2 pair	Butt hinge H3
1 each	Lockset LK5
1 each	Cylinder LC1
1 each	Regular door closer RDC1
3 each	Silencer SC
1 each	Door bumper ST1 (if wall-mounted)
1 each	Door stop ST2 (if floor-mounted)
1 each	Kick plate KP
1 each	Threshold TH
1 each	Weatherstrip WS

### Set No. 25: Elevator machine room

1-1/2 pair	Butt hinge H4 (H2 if reverse-bevel door)
1 each	Lockset LK1
1 each	Cylinder LC1
1 each	Regular door closer RDC1 (if reverse-bevel door is required and 180-degree swing is not required)
1 each	Regular door closer RDC2 (if regular-bevel door is required)
1 each	Regular door closer RDC4 (if reverse-bevel door is required and 180-degree swing is required)
3 each	Silencer SC
1 each	Door bumper ST1 (if wall-mounted) (Omit if RDC1 is used)
1 each	Door stop ST2 (if floor-mounted) (Omit if RDC1 is used)
1 each	Mop plate MP (if in public area and reverse-bevel door) (Omit if exterior door)
1 each	Kick plate KP (if in public area and regular-bevel door)
1 each	Threshold TH (if exterior; use TH1 if there is a drop in floor elevation to exterior)
1 set	Weatherstrip WS (if exterior door)

Sets No. 26 and 27 - Not used

Set No. 28: Fan room chamber





## 08000 - Doors & Windows

1-1/2 pair	Butt hinge H3 (1 pair if dwarf door)
1 each	Latchset L (Omit if dwarf door)
1 each	Overhead control OH (if reverse-bevel door is required) (Omit if dwarf door)
1 set	Air seal AIR (Coordinate with mechanical contractor)
1 each	Automatic door bottom ADB (Coordinate with mechanical contractor) (Omit if dwarf door)
3 each	Silencer SC (Omit if dwarf door)
2 each	Door bumper ST1 (if wall-mounted) (Omit if dwarf door)
2 each	Door stop ST2 (if floor-mounted) (Omit if dwarf door)
1 each	Surface bolt SB1 (if dwarf door)
1 each	Door pull DP (if dwarf door)
Set No. 29	
1-1/2 pair	Butt hinge H1 (H3 if regular-bevel door)
1 each	Lockset LK1
1 each	Cylinder LC1
1 each	Regular door closer RDC1 (if reverse-bevel door is required and 180-degree swing is not required)
1 each	Regular door closer RDC2 (if regular-bevel door is required)
1 each	Regular door closer RDC4 (if reverse-bevel door is required and 180-degree swing is required)
1 each	Door bumper ST1 (if wall-mounted) (Omit if RDC1 is used)
1 each	Door stop ST2 (if floor-mounted) (Omit if RDC1 is used)
1 each	Kick plate KP
1 set	Air seal AIR (if room will be an air plenum)
1 each	Automatic door bottom ADB (if room will be an air plenum)
3 each	Silencer SC (Omit if air seal is required)
Set No. 30: Mechanical equipment room	
3 pair	Butt hinge H3 (4 pair if 8'-0 high door)
1 each	Lockset LK1
1 each	Dummy trim DT (Omit if in ancillary corridor)
1 each	Cylinder LC1
1 each	Kick plate KP
2 each	Mop plate MP
2 each	Flush bolt FBI (on inactive leaf)
1 set	Air seal AIR (if room will be an air plenum)
2 each	Automatic door bottom ADB (if room will be an air plenum)
1 each	Regular door closer RDC1 (if reverse-bevel door is required and 180-degree swing is not required)
1 each	Regular door closer RDC2 (if regular-bevel door is required)
1 each	Regular Door Closer RDC4 (if reverse-bevel door is required and 180-degree swing is required)
2 each	Silencer SC (Omit if air seal required)
2 each	Door bumper ST1 (if wall-mounted)
2 each	Door stop ST2 (if floor-mounted)



## 08000 - Doors & Windows

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### Set No. 31: Mechanical equipment room

1-1/2 pair	Butt hinge H3
1 each	Lockset LK1
1 each	Cylinder LC1
1 each	Overhead control OH
1 set	Air seal AIR (if room will be an air plenum)
1 each	Automatic door bottom ADB (if room will be an air plenum)
3 each	Silencer SC (Omit if air seal required)
1 each	Door bumper ST1 (if wall-mounted)
1 each	Door stop ST2 (if floor-mounted)

### Set No. 32: Mechanical equipment room

3 pair	Butt hinge H3 (4 pair if 8'-0 high door)
1 each	Lockset LK1
1 each	Cylinder LC1
2 each	Overhead control OH (if reverse-bevel door is required)
1 set	Air seal AIR (if room will be an air plenum)
1 each	Automatic door bottom ADB (if room will be an air plenum)
2 each	Flush bolts FB1 (on inactive leaf)
4 each	Silencer SC (Omit if air seal required)
2 each	Door bumper ST1 (if wall-mounted)
2 each	Door stop ST2 (if floor-mounted)

### Sets No. 33: Battery room

1-1/2 pair	Butt hinge H3
1 each	Latchset L
1 each	Regular door closer RDC5 (if reverse-bevel door)
1 each	Regular door closer RDC3 (if regular-bevel door)
3 each	Silencer SC
1 each	Door bumper ST1 (if wall-mounted)
1 each	Door stop ST2 (if floor-mounted) (Omit if door is on a curb)

### Set No. 34: Interior conditioned spaces at yards and shops

1/2 pair	Butt hinge H6
1 each	Latchset L
3 each	Door silencer SC
1 each	Kick plate KP
1 each	Mop plate MP

### Set No. 35: Interior conditioned spaces at yards and shops

1 1/2 pair	Butt hinge H6
1 each	Lockset LK1
1 each	Cylinder LC1
1 each	Regular door closer RDC1 (if reverse-bevel door is required and 180-degree swing is not required)
1 each	Regular door closer RDC2 (if reverse-bevel door is required)
3 each	Door silencer SC



## 08000 - Doors & Windows

1 each	Kick plate KP
1 each	Mop plate MP

### Set No. 36: Train Control Room

1 pair	Butt hinge HI (1-1/2 pair if 8'-0 high door)
1 each	Lockset LK1
1 each	Cylinder LC1
1 each	Security coverplate SH9
1 each	Regular door closer RDC1
1 each	Door position switch SH2
1 each	Security switch SS4 (Coordinate location with Engineer)
1 each	Cylinder LC3 (for use with SS4)
1 each	Threshold TH (Use TH1 if there is a drop in floor elevation on exterior)
3 each	Silencer SC
1 each	Kick plate KP
1 each	Mop plate MP (Omit if exterior)

### Set No. 37: Train Control Room

3 1/2 pair	Butt hinge H1
1/2 pair	Electric butt hinge H5
1 each	Lockset LK1
1 each	Electric strike SH3
1 each	Cylinder LC1
1 each	Security coverplate SH9
1 each	Regular door closer RDC1 (if 180-degree swing is not required)
1 each	Regular door closer RDC4 (if 180-degree swing is required)
2 each	Door position switch SH2
2 each	Security switch SS4 (one as a spare) (Coordinate location with electrical contractor)
1 each	Cylinder LC3 (for use with SS4)
2 each	Flush bolt FB1 (on inactive leaf; 24 inches long for top bolt)
2 each	Kick plate KP
2 each	Mop plate MP (Omit if exterior)
1 each	Threshold TH (if exterior door)
1 set	Weatherstrip WS (if exterior door)
4 each	Silencer SC

### Set No. 38 - Not used

### Set No. 39: Zone Center Control Room

4 pair	Butt hinge H3 (If reverse-bevel door, use H1)
1 each	Lockset LK1
1 each	Cylinder LC1
1 each	Regular door closer RDC1 (if reverse-bevel door is required and 180-degree swing is not required)
1 each	Regular door closer RDC2 (if regular-bevel door is required)



## 08000 - Doors & Windows

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1 each	Regular door closer RDC4 (if reverse-bevel door is required and 180-degree swing is required)
2 each	Silencer SC
2 each	Door bumper ST1 (if wall-mounted) (Omit if RDC1 is used)
2 each	Door stop ST2 (if floor-mounted) (Omit if RDC1 is used)
2 each	Kick plate KP
2 each	Flush bolt FB1 (on inactive leaf)
2 each	Mop plate MP

### Set No. 40: Zone Center Equipment Room

4 pair	Butt hinge H3
1 each	Lockset LK1
1 each	Cylinder LC1
1 each	Regular door closer RDC1 (if reverse-bevel door is required and 180-degree swing is not required)
1 each	Regular door closer RDC2 (if regular-bevel door is required)
1 each	Regular door closer RDC4 (if reverse-bevel door is required and 180-degree swing is required)
2 each	Flush bolt FB1 (on inactive leaf)
2 each	Silencer SC
2 each	Door bumper ST1 (if wall-mounted)
2 each	Door stop ST2 (if floor-mounted)
2 each	Kick plate KP
2 each	Mop plate MP
1 each	Threshold TH3

### Set No. 41: Secured storage room

1 1/2 pair	Butt hinge H1
2 each	Lockset LK1
2 each	Cylinder LC1
2 each	Electric strike SH4
1 each	Push button PB
1 each	Regular door closer RDC1 (if reverse-bevel door)
1 each	Regular door closer RDC2 (if regular-bevel door)
3 each	Silencer SC
1 each	Kick plate KP
1 each	Mop plate MP
1 each	Door bumper ST1 (if wall-mounted) (Omit if RDC1 is used)
1 each	Door stop ST2 (if floor-mounted) (Omit if RDC1 is used)

Set No. 42 - Not used

Set No. 43: Not used

### Set No. 44: Secure Room only

1/2 pair	Butt hinge H4 (2 pairs if 8'-0 high door, H2 if reverse- bevel door)
2 each	Lockset LK1



## 08000 - Doors & Windows

2 each	Deadlock DL1
2 each	Cylinder LC4 (for use with LK1)
2 each	Cylinder LC1 (for use with DL1)
2 each	Security switch SS4 (one as a spare)
1 each	Cylinder LC3 (for use with SS4) (Key to match LC4)
1 each	Regular door closer RDC1 (if reverse-bevel door is required)
1 each	Regular door closer RDC2 (if regular-bevel door is required)
2 each	Door position switch SH2
3 each	Silencer SC
1 each	Door bumper ST1 (if wall-mounted) (Omit if RDC1 is used)
1 each	Door stop ST2 (if floor mounted) (Omit if RDC1 is used)
1 each	Kick plate KP
1 each	Mop plate MP (Omit if exterior)
1 set	Weatherstrip WS (if exterior door)
1 each	Threshold TH (Omit if interior door)

### Set No. 45: Staff room

1-1/2 pair	Butt hinge H3 (H1 if reverse-bevel door)
1 each	Lockset LK1
1 each	Dead lock DL2
3 each	Cylinder LC1
1 each	Regular door closer RDC1 (if reverse-bevel door is required and 180-degree swing is not required)
1 each	Regular door closer RDC2 (if regular-bevel door is required)
1 each	Regular door closer RDC4 (if reverse-bevel door is required and 180-degree swing is required)
1 each	Kick plate KP
1 each	Mop plate MP
3 each	Silencer SC
1 each	Door bumper ST1 (if wall-mounted) (Omit if RDC1 is used)
1 each	Door stop ST2 (if floor-mounted) (Omit if RDC1 is used)

### Set No. 46: Toilet room in Zone Center

1-1/2 pair	Butt hinge H3
1 each	Lockset LK2
1 each	Kick plate KP
1 each	Mop plate MP
1 each	Regular door closer RDC3
3 each	Silencer SC
1 each	Door bumper ST1 (if wall-mounted)
1 each	Door stop ST2 (if floor-mounted)

### Set No. 47: Ready room in Zone Center

1-1/2 pair	Butt hinge H3
1 each	Lockset LK1
1 each	Cylinder LC1
1 each	Regular door closer RDC3



## 08000 - Doors & Windows

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3 each	Silencer SC
1 each	Door bumper ST1 (if wall-mounted)
1 each	Door stop ST2 (if floor-mounted)
1 each	Kick plate KP
1 each	Mop plate MP

Set No. 48 - Not used

Set No. 49: Gap breaker in fenced location

4 pair	Butt hinge H2
1 each	Lockset LK1
1 each	Cylinder LC1
1 each	Regular door closer RDC4
1 each	Security coverplate SH9
1 each	Cane bolt CB (in inactive leaf)
1 each	Chain bolt CH-B (on inactive leaf)
1 each	Threshold TH3
4 each	Silencer SC
1 set	Weatherstrip WS

Set No. 50: Gap breaker (remote from Station)

4 pair	Butt hinge H2
1 each	Lockset LK1
1 each	Cylinder LC1
1 each	Security coverplate SH9
1 each	Regular door closer RDC4
1 each	Cane bolt CB (on inactive leaf)
1 each	Chain bolt CH-B (on inactive leaf)
2 each	Door position switch SH2
4 each	Silencer SC
1 each	Security switch SS4 (Coordinate location with electrical contractor)
1 each	Cylinder LC3 (for use in security switch)
1 set	Weatherstrip WS
1 each	Threshold TH3

Set No. 51

1 each	Safety hasp SH
1 each	Padlock PL

Sets No. 52 and 53 - Not used

Set No. 54

1 each	Padlock PL
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Remainder of hardware is described in Section for gate.

Set No. 55

1 each	Padlock PL
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## 08000 - Doors & Windows

Remainder of hardware is described in Section for subway sliding door.

### Set No. 56

- 1 each Padlock PL
- 1 each Regular door closer RDC4

Remainder of hardware is described in Section for subway swing door.

### Set No. 57 - Not used

### Set No. 58 (Not for Handicapped Gate)

- 1 each Cylinder LC1 (for Alarm On/Off Switch)
- 1 each Panic device PD2
- 1 each Gate closer GC2
- 1 each Monitor strike SH5
- 1 each Exit alarm SH6

### Sets No. 59 through 63 - Not used

### Set No. 64: Traction power Substation (remote from Station)

- 1 each Cylinder LC1 (if motor operation)
  - 1 each Padlock PL (if manual operation)
  - 2 each Door position switch SH1 (if mortised type required. Use with waterproof junction box if recessed in slab) (one as a spare)
  - 2 each Door position switch SH2 (if surface-mounted type is required) (one as a spare)
- Remainder of hardware is described in Section for appropriate door.

### Set No. 65: Traction power Substation

- 3 pair Butt hinge H1 (H3 if regular-bevel door and door is 86 inches high)
- 4 pair Butt hinge H2 (H4 if regular-bevel door and door is 106 inches high)
- 1 each Lockset LK1
- 1 each Regular door closer RDC4 (on active leaf)
- 1 each Cylinder LC1
- 1 each Cane bolt CB (on inactive leaf)
- 1 each Chain bolt CH-B
- 2 each Door bumper ST1 (if wall-mounted)
- 1 each Door stop ST2 (if floor-mounted)
- 4 each Door position switch SH2 (two as spares)
- 4 each Silencer SC

### Set No. 66: Service entrance-traction power Substation (remote from Station)

- 1-1/2 pair Butt hinge H1
- 1 each Lockset LK1
- 1 each Cylinder LC1
- 1 set Weatherstrip WS
- 1 each Threshold TH (Use TH1 if there is a drop in floor elevation on exterior)
- 1 each Regular door closer RDC1



## 08000 - Doors & Windows

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2 each	Security switch SS4 (one as a spare) (Coordinate location with electrical contractor)
1 each	Cylinder LC3 (Use with SS4)
1 each	Security coverplate SH9
2 each	Door position switch SH2 (one as a spare)
3 each	Silencer SC
1 each	Kick plate KP (if not exterior door)
Set No. 67:	Man-door and emergency exit-traction power Substation (remote from Station)
1-1/2 pair	Butt hinge H1
1 each	Lockset LK1
1 each	Cylinder LC1
2 each	Door position switch SH2 (one as a spare)
1 each	Threshold TH (Use TH1 if there is a drop in floor elevation on exterior)
1 each	Regular door closer RDC1
1 set	Weatherstrip WS
2 each	Silencer SC
Set No. 68	
5 pair	Butt hinge H2 (H4 if regular-bevel door)
1 each	Lockset LK1
1 each	Cylinder LC1
1 each	Regular door closer RDC4 (if reverse-bevel door)
1 each	Regular door closer RDC2 (if regular-bevel door)
1 each	Chain bolt CH-B (on inactive leaf)
1 each	Cane bolt CB (on inactive leaf)
2 each	Silencer SC
1 each	Security coverplate SH9
2 each	Kick plate KP
1 each	Threshold TH2 (Use TH1 if there is a drop in floor elevation on exterior)
Set No. 69: Auxiliary electrical room	
5 pair	Butt hinge H4 (H2 if reverse-bevel door)
4 pair	Butt hinge H7 (if door higher than 12 feet)
1 each	Lockset LK1
1 each	Cylinder LC1
1 each	Regular door closer RDC4 (if reverse-bevel door)
1 each	Regular Door Closer RDC2 (if regular-bevel door)
1 each	Cane bolt CB (on inactive leaf)
1 each	Chain bolt CH-B (on top of inactive leaf)
4 each	Silencer SC
2 each	Kick plate KP
2 each	Mop plate MP (omit if exterior door)
1 each	Security coverplate SH9 (if an exterior door)
1 each	Threshold TH2 (if exterior door. Use TH1 if there is a drop in floor elevation on exterior)





END OF SECTION 08900



## SECTION 08912

### ALUMINUM WINDOW WALLS / CURTAIN WALLS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of aluminum window walls. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
  - 2.1 System Performance:
    - 2.1.1 Load-Bearing Strength (wind resistance) shall be in accordance with ASTM E330, ANSI A58.1, and AAMA TIR-A2.
    - 2.1.2 Deflections and Thermal Movements shall be as recommended by the wall manufacturer for the project site.
    - 2.1.3 Leakage Resistance: Air leakage shall be in accordance with ASTM E283. Water penetration shall be in accordance with ASTM E331.
    - 2.1.4 Condensation shall be in compliance with AAMA 1502.6 for the project site.
    - 2.1.5 Sound Transmission Classification (STC) shall be as designated by the Contracting Officer and in accordance with ASTM E90.
    - 2.1.6 The wall system shall comply in general with applicable provisions of the AAMA Metal Curtain Wall, Window, Store Front, and Entrance Guide Specifications Manual.
  - 2.2 System Component's:
    - 2.2.1 Aluminum Members (extrusions, Formed members, sheet, and plate shall be in compliance with requirements of ASTM B221 for extrusions and ASTM B 209 for sheet / plate.
    - 2.2.2 Insulated Panels shall be laminated aluminum-faced panels finished to match window wall framing. Face sheets shall be not less than 0.0249 inch thick. Concealed back sheets shall be of aluminum or galvanized steel. Edge condition of panels shall be prepared for installation into framing, and either sealed or vented to exterior only. Panels shall be flat, with no deviations exceeding ASTM C314 recommendations. Insulated core shall meet the designated k-value.
    - 2.2.3 Brackets and Reinforcements shall be high-strength aluminum units where feasible. Otherwise, nonmagnetic stainless steel shall be used, except at fabricator's option. Brackets not exposed to weather or abrasion may be hot-dipped galvanized steel complying with ASTM A 386. Provide nonstaining, nonferrous shims for installation and alignment of window wall work.
    - 2.2.4 Window Cleaner's Bolts, if required, shall be nonmagnetic stainless steel complying with ANSI A39.1.
    - 2.2.5 Concealed Flashing shall be dead-soft stainless steel, 26 gauge.



## 08000 - Doors & Windows

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- 2.2.6 Fasteners and Accessories shall have exposed portions matching finish of window wall system. At joints where movement must be accommodated, provide slip-joint linings of sheets, pads, shims, or washers of fluorocarbon resin or similar material recommended by manufacturer.
- 2.2.7 Inserts for Concrete Masonry shall be cast iron malleable iron, or hot-dipped galvanized steel complying with ASTM A 386.
- 2.2.8 Firestopping Materials shall be mineral fiber insulation or other noncombustible material suitable for permanent placement and complying with applicable regulations.
- 2.2.9 Finishes shall comply with NAAMM AA-M32C21A31 (0.4 mil) for natural aluminum color and NAAMM AA M32C21A32 (0.4 mil) for integral color anodized finish.
- 3.0 EXECUTION: (Section not used.)

END OF SECTION 08912

END OF SPECIFICATION SECTION 08 – Doors & Windows



## 08000 - Doors & Windows

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## SECTION 09110

### METAL FURRING AND LATHING

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of metal furring and lathing. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Application procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.1 Work installed but furnished elsewhere:
  - A. Access Doors: Set in ceilings and in furred out walls.
  - B. Recessed Ceiling Outlet Frames: Install all recessed ceiling outlet frames and air diffuser frames.
- 1.2 Regulatory Agencies:
  - A. Uniform Building Code.
  - B. Metal Lath Manufacturers Association.
- 1.3 Samples: Submit three (3) samples of the following for approval prior to delivery to job:
  - A. Lathing: Coated and uncoated 12-inch square.
  - B. Wire: Not less than 8 inches long.
  - C. Furring Bars
  - D. Running Bars
  - E. Hangers for Suspended Ceilings
  - F. Corner Beads
  - G. Casing Beads (Plaster Stops)
- 2.0 PRODUCTS:
- 2.1 Materials:
  - A. Furring Bars: 1-inch standard rolled steel channels weighing 0.41 lbs. per foot as per Uniform Building Code.
  - B. Running Bars:
    - 1. 1 1/2-inch channels weighing not less than 0.85 lbs. per lineal foot.
    - 2. Bars bolted to hangers with 3/8-inch diameter round head bolts located at least 3/8-inch from end of hanger.
    - 3. Bars bolted to hanger.



## 09000 - Finishes

- C. Metal Lathing: Expanded metal weighing not less than 3.4 lbs. per square yard, heavily coated with hot asphaltic cement by dipping.
- D. Wire:
  - 1. 18-gauge, U.S.S. 18-8, dead soft stainless steel wire or;
  - 2. 18-gauge soft temper cold drawn Monel metal wire suitable for twisting.
- E. Corner Beads: Small nose, #22-gauge min., galvanized steel with perforated or expanded flanges not less than 2 1/2-inches wide, large nose for Vermiculite plaster.
- F. Plaster Stops: #24-gauge min., galvanized steel expanded flanges not less than 2-inches wide.
- G. Base Screeds: #24 gauge min. sheet steel, hot galvanized with key holes or expansion type.
- H. Hangers for Suspended Ceilings:

Any one of the following is acceptable:

  - 1. Top members of hangers for furred or hung ceilings under poured concrete slabs shall be 1 x 3/16-inch flats, riveted to a 1 x 3/16-inch channel, seven inches long, cast into concrete slab. Bottom member shall be 1 x 3/16-inch flat, spaced four feet on centers both ways.
  - 2. Swivel type hangers for support of hung ceilings as indicated.
  - 3. "Ankortite Inserts" by Ankortite Products Inc., Parsons, Kansas or equal.
  - 4. 1/4-inch diameter galvanized steel rod hangers in lieu of flat bars as in (1.) above. Rod hanger shall be hooked into anchors. Carrying channels shall be attached to rod hanger with channel clamps Model #4B-1-5L by Erico Products Corp. Cleveland, Ohio, or equal.

2.2 Painting: All steel members such as flats, angles, channels, etc., unless galvanized, shall be dipped or painted one coat of approved asphaltum paint.

### 3.0 EXECUTION:

#### 3.1 Coordination With Other Trades:

- A. Coordinate this work with other trades who may have ducts, pipes, conduits, or other work in the spaces above the suspended ceilings, in order that he may properly place anchors, hangers and carrying bars if necessary to avoid such ducts, pipes, conduits, etc.
- B. Provision shall be made for the installation of lighting fixtures, ventilating or air conditioning equipment, access openings, and similar installations.
- C. Rigid frames of furring channels or angles shall be provided around openings, adequately braced and reinforced. Access panels shall be installed where directed.

END OF SECTION 09110



## SECTION 09111

### STEEL METAL PARTITIONS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of Drywall Metal Framing. Products shall be as directed by the Contracting Officer. Application procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.1 Manufacturer:
  - 1.1.1 "Holostud" System by National Gypsum Co., Buffalo, NY
  - 1.1.2 Or approved equal.
- 1.2 Submittals:
  - A. Samples:
    - 1. Submit samples of stud, track, shoes, wire and metal lath for approval before any work commences.
    - 2. Submit three (3) samples of coated lath and three (3) samples of uncoated lath, each 12-inch square as specified for approval before any work commences.
  - B. Shop Drawings: Submit for approval showing partitions fully dimensioned.
- 2.0 PRODUCT:
- 2.1 Steel Studs:
  - A. Steel studs shall be hollow type spaced 16-inches on centers of sizes indicated, built up with diagonal wire web of No. 7 gauge cold drawn wire, diagonally spaced and welded at 8-inch intervals between outer chords of 1/2-inch x 1/2-inch angles, No. 16-gauge cold rolled steel.
  - B. Place steel studs approx. 2-inches from abutting partitions and 2-inches from each side of interior angle of all corners.
  - C. Steel studs shall be secured to top tracks with 22-gauge galvanized steel adjustable stud shoes.
- 2.2 Stud Tracks:
  - A. Floor and ceiling stud tracks shall be 22-gauge cold rolled steel with 1/2-inch legs and securely fastened to beams, slabs or partitions with 1/2-inch stud bolts or other method approved by manufacturer spaced not more than 24 inches on centers.
  - B. In locations where partitions are on an existing floor (wood, asphalt tile, etc.), remove existing floor to allow partition to be secure to a sound concrete sub-surface.
- 2.3 Stud Shoes: Stud shoes shall be wire tied to studs with two double strands of 18-gauge galvanized tie wire.



## 09000 - Finishes

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- 2.4 Horizontal Bracing: Shall consist of 3/4-inch steel furring channels fastened to inside of stud with webs in a horizontal position. Spacing of channels shall not exceed 6 feet.
- 2.5 Metal Lathing, Etc.:
- A. Metal lath shall be expanded type weighing not less than 3.4 pounds per square yard, heavily coated with hot asphaltic cement by dipping.
  - B. Lath shall be wired to steel studs at 7-inch intervals with 18-gauge U.S.S. 18-8, dead soft stainless steel wire; or with 18-gauge soft temper cold drawn Monel wire suitable for twisting.
  - C. Contractor has option of using 16 B. and S. gauge .050 inches, Everdur 1010 alloy, metal tie wire equal to ASTM Specification B-99 latest Edition, Type-A one-eighth hard, or Olympic bronze tie wire manufactured by Chase Brass and Copper Company, equal to 16 B. and S. gauge .050 inches Everdur wire and the ASTM-B-99 latest edition.
  - D. All wire used by the lathing sub-contractor at the job for securing metal lath and furring shall be of one type.
  - E. Metal lath accessories shall consist of tie wire as above specified, base screeds, cornerite, all interior wall and partition angles, stapled or wire-tied to lath.
  - F. Base screed shall be of not less than 24-gauge sheet steel hot galvanized with keyholes or expansion type.
- 2.6 Gypsum Lath:
- A. In thickness indicated on drawings and as required by spacing of studs.
  - B. Applied perpendicular to studs with appropriate clips.
- 3.0 EXECUTION:
- 3.1 Inspection: Check progress of work of other trades in area before commencing with installation.
- 3.2 Discrepancies:
- A. Immediately notify the Contracting Officer.
  - B. Do not proceed until fully corrected.
- 3.3 Installation: Align stud track accurately to the partition layout at both floor and ceiling.
- 3.4 Adjustments:
- A. Adjust all members for straight and proper alignment.
  - B. Adjust metal lath and gypsum base and verify that all such work is complete and ready for plastering.

END OF SECTION 09111





## SECTION 09150

### PLASTER AND PLASTER REPAIR

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of plaster for repairs. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.1 General References Comply with requirements of the latest editions of the following American National Standards Institute (ANSI) Specifications and as further specified herein and in the Schedule.
- A. A42.1, Standard Specifications For Gypsum Plastering.
  - B. A42.3, Standard Specifications For Portland Cement Plastering.
  - C. A42.4, Standard Specifications For Interior Lathing And Furring.
- 2.0 PRODUCTS:
- 2.1 Materials
- A. Hydrated Lime  
ASTM C 206, if required by manufacturer, lime shall be allowed to soak for 24 hours before use, If necessary to obtain a fine textured putty, mix lime with water and screen through a sieve.
  - B. Gypsum Plaster  
ASTM C 28
  - C. Sand  
ASTM C 35
  - D. Portland Cement  
ASTM C 150
  - E. Vermiculite  
ASTM C 35
  - F. Water  
Shall be clean and free from deleterious substances.
  - G. Temporary Grounds  
5/8 inch thick for masonry surfaces and 3/4 inch thick for metal lath surfaces.
  - H. Bonding Agent: A material specially manufactured for bonding plaster to concrete. "Plaster-Weld" by Larsen Products Corp. and "Link" by American Sta-Dri Co, or equal. Submit brand



## 09000 - Finishes

name for approval. Note: Where a premixed white cover coat is used on concrete surfaces, the plaster manufacturer's special cover coat bonding agent, furnished with the cover coat in a separate container, shall be used therewith.

- I. Keene's Cement Plaster: ASTM C 61. Option: Structo-gauge by U.S. Gypsum, or equal may be used in lieu of Keene's cement. Apply hard finish plasters over gypsum-sand base coats only.
- J. Bond Plaster: Shall be a ready-mixed gypsum base coat plaster specially formulated for application to concrete surfaces and requiring only the addition of water at the job. Submit brand name for approval.
- K. Acoustical Plaster: A ready -mixed gypsum acoustical finishing plaster with a Boise Reduction Coefficient of not less than 0.55 by National Bureau of Standards rating or Acoustical Materials Assn. rating when applied 1/2 inch thick over 1/2 inch gypsum base plaster on metal lath. Submit brand name for approval.
- L. Plaster Cover Coat: Pre-mixed gypsum finish plaster for application on unpainted concrete surfaces over a bonding agent. Shall be Red Top Cover Coat or equal.
- M. Metal Studs: Prefabricated type fabricated of not less than 16 ga. steel and coated with a rust inhibitive coating after fabrication. Shall be equal to prefabricated metal studs of the following manufacture:
  - 1. Truscon Steel Col, Youngstown, Ohio.
  - 2. Wheeling Corrugating Co., Wheeling, West Va.
  - 3. Penn Metal Co., Parkersburgh, West Va.
  - 4. U.S. Gypsum Co., Chicago, Ill.
- N. Ceiling Supports:
  - a. Tee Inserts: Shall consist of 2-one inch hot-rolled steel channels weighing not less than 0.60 lbs. per lin.ft., or 1" x 3/16" steel bars, not less than 7" long each, bolted, riveted or welded together to form a "T" and punched at lower end of stem to receive a 3/8" bolt. No slotted holes permitted.
  - b. Clincher clamps: Shall consist of 2 - 1 1/2" x 3/8" steel bars formed to clamp around bottom flange of steel beams and punched at lower end to receive 3/8" bolt. No slotted holes permitted.
  - c. Hangers: Asphaltum painted 1" x 1/4" steel bars punched at each end to receive a 3/8" bolt. No slotted holes permitted. Where runner bars run at right angles to direction of roof beams hangers shall be fabricated with a 90° twist for alignment.
  - d. Runners: Asphaltum painted hot-rolled steel channels of the following minimum sizes:
    - 1. For spans not exceeding 5'-0", 1 1/2" x 1/2" x 1/8".
    - 2. For spans not exceeding 6'-6", 2" x 1/2" x 1/8".
    - 3. For spans not exceeding 8'-0", 2" x 1" x 1/16".
  - e. Cross Furring: Asphaltum painted hot-rolled steel channels of the following minimum sizes:



1. For spans not exceeding 5'-0", 1" x 3/8" x 1/8".
2. For spans not exceeding 6'-6", 1 1/4" x 1/2" x 1/8".
3. For spans not exceeding 8'-0", 2" x 2" x 1/4".

O. Lath:

- a. Gypsum Lath: Perforated type complying with ASTM C 37 and Fed. Spec. SS-P-431 . Thickness and face dimensions as specified in Schedule.
- b. Diamond Mesh Metal Lath: Galvanized steel expanded diamond mesh. Weight not less than 3.4 lbs. per sq. yd. Where self-furring lath is specified mesh shall have indentations or "dimples" that will hold lath not less than 3/8" from backing. Indentations spaced not more than 2" o each way.
- c. Rib Metal Lath: Asphaltum painted copper alloy steel. Weight not less than 3.4 lbs. per sq. yd. Herringbone pattern with main ribs not less than 3/8" deep and spaced not more than 4 1/2" o and intermediate ribs not less than 1/8" deep.

P. Miscellaneous Items:

- a. Tie Wire: Monel metal, stainless steel or silicon-copper alloy. Not less than 0.0475" diameter for tying lath and not less than 0.062" diameter for all other tying.
- b. Lath Clips: No. 8 ga. (A.S. & W.) galvanized hairpin wire clips.
- c. Corner Beads: Bullnose expanded flange type fabricated of not less than 26 ga. galvanized steel. Expanded flanges not less than 2 1/2" wide each side.
- d. Base Screeds: Fabricated of not less than 26 ga. galvanized steel. Expanded flange or rail type as specified.
- e. Picture Molds: Concealed rail type fabricated of not less than 26 ga. galvanized steel.
- f. Casing Beads: Expanded flange type fabricated of not less than 24 ga. galvanized steel. Square, quarter round or beveled edge as specified.
- g. Bolts: Steel stove bolts. Paint with asphaltum after erection of work.

P. Base Coats:

- a. Gypsum-Perlite Base Coats: Shall be ready-mixed gypsum perlite aggregate plaster requiring only the addition of water at the job. Shall be pre-mixed in the proportions of 100 lbs. of gypsum neat plaster and not more than 2 1/2 cu. ft. of perlite. Shall be equal to Red Top Structo-Lite by U.S. Gypsum and Gypsolite by National Gypsum Co.
- b. Gypsum-Vermiculite Base Coat: Same as specified for above for perlite aggregate base coats except aggregate shall be vermiculite.
- c. Gypsum-Sand Base Coats: Shall be mixed in the proportions of one part gypsum neat plaster and not more than 2 1/2 parts sand, by weight.
- d. Bond Plaster Base Coat: Shall be a ready-mixed bond plaster as specified under Materials. Water only shall be added at the job.

Q. Finish Coats:



## 09000 - Finishes

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- a. Gypsum-Lime Putty Finish (White Coat): Shall be mixed in the proportions of one part calcimined gypsum (gauging plaster) to not more than 3 parts lime putty, by volume. Add to the above mix 1/2 cu. ft. perlite fines and 25 lbs. fine silicate sand per 100 lbs. gauging plaster for application over light weight aggregate base coats.
- b. Keene's Cement-Lime Putty Finish: Shall be mixed in the proportions of 100 lbs. of Keene's cement and not more than 50 lbs. of lime putty (25 lbs. of dry hydrated lime). Where Structo-gauge is used in lieu of Keene's cement mix in proportions of not more than 100 lbs. of hydrated lime per 100 lbs. of Structo-gauge.
- c. Acoustical Plaster Finish: Shall be a ready-mixed acoustical plaster as specified under materials. Water only shall be added at the job.
- d. Gypsum-Vermiculite Finish: Shall be mixed in the proportions of 100 lbs. of calcimined gypsum (gauging plaster) to not more than one cu. ft. of vermiculite finishing aggregate.
- e. Cover Coat: Pre-mixed. Add water only at the job.
- f. Portland Cement Plaster: All coats shall be mixed in the proportions of one part Portland cement, 1/4 part hydrated lime and not less than 3 nor more than 5 parts sand. Scratch coats or lath shall be fibered with one pound of horsehair, or approved substitute, per sack of cement.

END OF SECTION 09150



## SECTION 09260

### GYPSON DRYWALL AND METAL STUDS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of gypsum drywall. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Application procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS
  - 2.1 Gypsum Panel - Sheet rock fire code gypsum panels (single layer).
  - 2.2 Fasteners - Self-tapping steel screws with rust inhibited coating.
  - 2.3 Insulation - 11/2- inch termafiber sound attenuating blankets or as circumstance dictates.
  - 2.4 Metal Accessories - Corner Beads, trim, etc. shall be galvanized steel.
  - 2.5 Joint Treatment - As recommended by manufacturer.
  - 2.6 Perimeter Caulking - Acoustical as recommended by manufacturer.
  - 2.7 Control Joints - Zinc.
  - 2.8 Joint compound shall be asbestos free type.
  - 2.9 Acoustical Sealant -As recommended by Manufacturer.
  - 2.10 Metal Studs
    - 2.10.1 Steel studs shall be hollow type spaced 16-inches on centers of sizes indicated, built up with diagonal wire web of No. 7 gauge cold drawn wire, diagonally spaced and welded at 8-inch intervals between outer chords on 1/2-inch x 1/2-inch angles, No. 16-gauge cold rolled steel.
    - 2.10.2 Place steel studs approx. 2-inches from abutting partitions and 2-inches from each side of interior angle of all corners.
    - 2.10.3 Steel studs shall be secured to top tracks with 22-ga. galvanized steel adjustable stud shoes.
  - 2.11 STUD TRACKS
    - 2.11.1 Floor and ceiling stud tracks shall be 22-ga. cold rolled steel with 1/2-inch legs and securely fastened to beams, slabs or partitions with 1/2-inch stud bolts or other method approved by manufacturer spaced not more than 24 inches on centers.
    - 2.11.2 In locations where drawings indicate partitions on an existing floor (wood, asphalt tile, etc.), remove existing floor to allow partition to be secured to a sound concrete sub-surface.
  - 2.12 STUD SHOES
    - 2.12.1 Stud shoes shall be wire tied to studs with two double strands of 18-ga. galvanized tie wire.



## 09000 - Finishes

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### 2.13 HORIZONTAL BRACING

2.13.1 Shall consist of 3/4-inch steel furring channels fastened to inside of stud with webs in a horizontal position. Spacing of channels shall not exceed 6 feet.

### 3.0 EXECUTION:

3.1 Gypsum ceiling panels screw attached to metal furring channels clipped or wire tied to suspended main runner channels or wire tied to main support members.

3.2 Provide control joints where ceiling abuts dissimilar wall or ceiling or a structural element.

3.3 Gypsum wall panels shall be screwed to metal studs or furring channels and to and bottom metal track.

3.4 All joints of ceiling or wall panels shall be taped with at least two coats of joint compound. See manufacturers instructions for applicable installation.

3.5 Align stud track accurately to the partition layout @ Both floor and Ceiling.

3.6 Adjust all members for straight and proper alignment.

END OF SECTION 09260



## SECTION 09315

### TILE FLOORING

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of ceramic tile flooring, and quarry tile flooring. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.1 Standards Requirements:
- A. Manufacture all Ceramic Tile in accordance with the provisions of ANSI AL137.1.
  - B. Install Ceramic Tile in accordance with recommendations contained in the "Handbook for Ceramic Tile Installation" of the Tile Council of America, Inc.
  - C. ALL TILE TO BE OF DOMESTIC MANUFACTURE.
  - D. Glazed and Unglazed Tile shall be made by same manufacturer.
- 1.2 Manufacturers:
- A. American - Olean Tile Co.
  - B. Dallas Ceramic Tile Co.
  - C. U.S. Ceramic Tile Co.
  - D. Or approved equal.
- 1.3 Quality Control Submittals:
- A. Before setting any tiles, furnish to the Contracting Officer a certificate of grade, etc., properly filled in on a Master Grade Certificate of the form recommended by the Department of Commerce.
  - B. Certificate shall be signed by the manufacturer of the tiles and by the sub-contractor for the work, shall state the grade, kind and full quantities of tiles; and give identification marks for all packages of tiles furnished under this Contract.
  - C. Brand packages with corresponding shipping marks.
- 2.0 PRODUCTS :
- A. Porcelain type unglazed ceramic floor tile with smooth all purpose edge not less than 1/4 inch thick in sizes 1-inch by 1-inch, 1-inch x 2-inch, 2-inch by 2-inch, or combination, as selected by the Contracting Officer. Average absorption not to exceed 1/2 of 1%.
  - B. Marble saddles with honed finish shall be provided where indicated on drawings.
  - C. Coved Base



## 09000 - Finishes

All Wainscots and facings shall start above a ceramic glazed tile base

6" x 6" with 3/4 minimum or 1" maximum radius sanitary cove except where other flooring or base are specified by the Contracting Officer.

- D. Quarry tile floor and coved base shall be made from carefully selected and graded shale and natural clays fired at extreme temperature to produce a strong, hard body with maximum uniformity in color and texture with resistance to acid, grease, odor, stain, fire and impact.
- E. Quarry tile shall be non-slip impregnated with abrasive aggregate 6" x 6" x 1/2: standard grade, ground four sided after firing and shall conform to ANSI A137.1.
- F. Tile to be set in waterproof Portland Cement (white) ASTM C-90. 1:3 mix, joint 1/4" maximum.
- G. Grouting: Quarry tile. Commercial sanded portland cement Type L & M Acid.R or UPCO hydroment.
- H. Mortar
  - A. Portland Cement ASTM C-150 Type 1
  - B. Sand ASTM C-144
  - C. Hydrated Lime ASTM C-206 or ASTM C-207 Type S
  - D. Mortar Proportions

Follow recommendations outlined in TCA "Handbook for Ceramic Tile Installation".

### 3.0 EXECUTION

#### 3.1 PREPARATION

- A. All surfaces to receive tile shall be firm, smooth, level, plumb and square.
- B. Inspect all surfaces prepared by others before starting tile work and report and unsatisfactory conditions. Starting tile work shall be considered as acceptance of work of others.

#### 3.2 INSTALLATION

- A. All tile to be set in accordance with dry-set Portland Cement Mortar A108.5-1967 as per Section W212-75 of Tile Council of America Handbook.
- B. Cut edges of tile shall be carefully ground and jointed. Do all cutting and drilling required for setting and as may be required by other contractors in a neat manner without marring the surface.
- C. Pitch floors approximately 1/8 inch per foot towards floor drains.
- D. GROUTING & FINISHING
  - Where possible, tile should not be grouted sooner than 48 hours after setting, to permit complete evaporation of solvents in the adhesive.
  - Clean all joints of dust, dirt, and excessive adhesive. Adhesive may be removed with a sharp knife or solvent.

END OF SECTION 09315





## SECTION 09320

### CERAMIC WALL TILE

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of ceramic wall tile. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.1 Standards Requirements:
  - 1.1.1 Manufacture all Ceramic Tile in accordance with the provisions of ANSI A137.1.
  - 1.1.2 Install Ceramic Tile in accordance with recommendations contained in the "Handbook for Ceramic Tile Installation" of the Tile Council of America, Inc.
  - 1.1.3 ALL TILE TO BE OF DOMESTIC MANUFACTURE.
  - 1.1.4 Glazed and Unglazed Tile shall be made by same manufacturer.
  - 1.1.5 Quality Control Submittals
    - A. Master Grade Certificate
      - 1. Before setting any tiles, furnish to the Contracting Officer a certificate of grade, etc., properly filled in on a Master Grade Certificate of the form recommended by the Department of Commerce.
      - 2. Certificate shall be signed by the manufacturer of the tiles and by the sub-contractor for the work, shall state the grade, kind and full quantities of tiles; and give identification marks for all packages of tiles furnished under this Contract.
      - 3. Brand packages with corresponding shipping marks.
- 1.2 Manufacturers
  - 1.2.1. American - Olean Tile Co.
  - 1.2.2. Dallas Ceramic Tile Co.
  - 1.2.3. U.S. Ceramic Tile Co.
  - 1.2.4. Or approved equal.
- 2.0 PRODUCTS:
  - 2.1 Tile shall be glazed, of Standard Grade.
  - 2.2 Cushion edged.
  - 2.3 External corners to be bullnosed and Internal corners to be square.
  - 2.4 4 1/4" x 4 1/4" or 6" x 4 1/4" tiles in the field.



## 09000 - Finishes

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- 2.5 Wainscots finished at top with bullnose and cap.
- 2.6 All trim including cap, bullnose, cove, external & internal corners shall match field tile in size and color.
- 2.7 Colors as selected by the Contracting Officer.
- 2.8 Grouting:
  - 2.8.1. GLAZED WALL TILE

Commercially prepared Portland Cement type grout, wet or dry-cure formula, as appropriate by L & M-SURCO or equal as approved by the Contracting Officer.
  - 2.8.2. UNGLAZED CERAMIC TILE

Commercial sanded Portland Cement type L & M ACID-R or UPCO Hydroment.
- 2.9 Mortar: Portland Cement -ASTM C150 Type 1
  - 2.9.2 Sand-ASTM C144
  - 2.9.3 Hydrated Lime-ASTM C206 or ASTM C207 Type S
  - 2.9.4 Mortar Proportions: Follow recommendations outlined in TCA "Handbook for Ceramic Tile Installation"
- 2.10 Inscriptions: There shall be one 4 1/4 by 8 1/2 inch glazed wall tile in locations where directed, bearing the inscription "Wash your hands before leaving this room". The lettering of this inscription shall be beneath and final glazing of the tile.
- 2.11 Tile Products:
  - 2.11.1 Ceramic Mosaic Tile: Provide factory-mounted porcelain tile, cushion edge, of 2" x 2" x 1/4" size, in color as selected by the Contracting Officer. Average absorption not to exceed 1/2 of 1%.
    - 2.11.1.1 Provide unglazed units for floor tile and base.
    - 2.11.1.2 Provide one color (floor and base tile) per room.
  - 2.11.2 Glazed Ceramic Tile: Provide square edged, glazed ceramic tile 4" x4", 4" x 6", 4" x 8" units; of 1/4" thickness as required to produce pattern indicated in colors selected by the Contracting Officer.
    - 2.11.2.1 Provide two colors, 2 per room, field color and trim /accent color.
- 2.13 Trim Units: Provide tile trim units to match characteristics of adjoining flat tile and to comply with following requirements:
  - 2.13.1 Size: Coordinated with sizes and coursing of adjoining flat tile.
  - 2.13.2 Shapes: Manufacturer's standard special shapes to suit installation.
    - a. Provide bullnosed units at exposed edge terminations.
    - b. Provide outside and inside radius corner units at all corners, respectively.
    - c. Provide cove base units.
- 3.0 EXECUTION
  - 3.1 Preparation



- 3.1.1 All surfaces to receive tile shall be firm, smooth, level, plumb and square.
- 3.1.2 Inspect all surfaces prepared by others before starting tile work and report all unsatisfactory conditions. Starting tile work shall be considered as acceptance of work of others.
- 3.2 Installation:
  - 3.2.1 All tile to be set in accordance with dry-set Portland Cement Mortar, ANSI A108.5 per Section W212-75 of Tile Council of America Handbook.
  - 3.2.2 All wall tile shall be laid up with vertical joints not over 1/16-inch thick, continuous and unbroken in perfect alignment.
  - 3.2.3 Tile shall be set, to the required levels and planes with true lines and angles.
  - 3.2.4 Cut edges of tile shall be carefully ground and jointed. Do all cutting and drilling required for setting as may be required by other contractors in a neat manner with out marring the surface.
  - 3.2.5 The tile setter shall cut holes in the base tile of toilet rooms where bronze tubing extends through the partitions into the adjoining pipe spaces.
  - 3.2.6 Grouting & Finishing
    - a. Where possible, tile should not be grouted sooner than 48 hours after setting, to permit complete evaporation of solvents in the adhesive
    - b. Clean all joints of dust, dirt, and excessive adhesive. Adhesive may be removed with a sharp knife or solvent.
  - 3.2.7 Application to match existing conditions.

END OF SECTION 09320



## SECTION 09400

### TERRAZZO

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for terrazzo floors and stairs. Products shall match (existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.1 Quality Assurance:
- A. Qualifications: Installer is to be a firm who has a minimum of three years experience with the installation of portland-cement terrazzo and has successfully completed installations of a similar size and scope as specified in this section.
  - B. Regulatory Requirements: Work of this section shall conform to all requirements of the following:
    - 1. National Terrazzo and Mosaic Association, Inc. (NTMA) specified provisions and recommendations.
    - 2. American Society of Testing and Materials (ASTM) requirements: Portland Cement, C150 Type I for interior applications.
      - Under bed reinforcement - A185
      - Isolation Membrane - ASTM C2103
      - Curing Compound - ASTM C309
      - Sand - ASTM C33
  - C. Mock Up/Sample Panel: Prior to the start of general work, prepare a sample section of the floor and obtain approval from the Contracting Officer before proceeding with the general work. Retain this sample during work, suitably marked, as a standard for judging completed work. After completion of work, Contractor may incorporate approved sample panel into finish floor. Exact dimension of the sample panel will be given by the Contracting Officer, as the size and complexity of the project dictate.
  - D. Single Source Responsibility: Obtain all materials from a single manufacturer, including all sealants and curing compounds, as recommended by terrazzo manufacturer.
- 1.2 Delivery, Storage and Handling:
- A. Deliver materials required for work of this section including but not limited to: cement, chips, color mix, sealers, cleaners in original, unopened containers bearing brand name and identification of manufacturers.
  - B. Store all materials inside, under cover in a manner to keep them dry, protected from weather, direct sunlight, surface contaminating, damage from construction traffic and other causes, adhering to all manufacturers recommendations for storage of materials.



- 1.3 Project Conditions:
- A. Maintain minimum temperatures above 40 degrees F during installation of the terrazzo and for a minimum of one week after placement of the terrazzo topping.
  - B. Inspection of Surfaces: Before beginning operations, examine, carefully all surfaces to receive terrazzo. Any finish which is found unsuitable to receive work should be reported to the Contracting Officer.
- 1.4 Guarantee: Terrazzo installer shall furnish written guarantee against defects due to improper or defective materials or workmanship for a period of one year following completion of the terrazzo installation.
- 2.0 PRODUCTS :
- 2.1 Terrazzo Materials and Installation shall comply with specifications and recommendations of The National Terrazzo and Mosaic Association, Inc. (NTMA)
- 2.2 Underbed Reinforcement shall be 2-inch by 2-inch by 16-gauge welded wire mesh, ASTM A 185, galvanized.
- 2.3 Isolation Membrane shall be polyethylene film, complying with ASTM C156, not less than 4.0 mils thick. Roofing felt conforming to ASTM D226 of equivalent.
- 2.4 Cast-In-Place Terrazzo Materials:
- 2.4.1 Portland Cement shall conform to ASTM C 150, Type I, except as modified to comply with NTMA requirements for compressive strength. Provide nonstaining white cement for terrazzo matrix. Provide standard gray cement for underbed.
  - 2.4.2 Sand shall conform to ASTM C 33.
  - 2.4.3 Aggregate shall be natural, sound, crushed marble chips without excessive flats or flakes, complying with NTMA requirements.
  - 2.4.4 Monolithic Terrazzo shall be 1/2-inch total thickness over concrete slab.
  - 2.4.5 Bonded Terrazzo shall be 1/2-inch terrazzo over a 1-1/4 inch minimum underbed.
- 2.5 Thinset Epoxy and Polyester Materials:
- 2.5.1 Polyacrylate Modified Cementitious Terrazzo Matrix: Polyacrylate and color pigment complying with NTMA "Guide Specification for Polyacrylate Modified Terrazzo.
  - 2.5.2 Polyester Resin Terrazzo Matrix: Two-component polyester resin and hardener, mineral filler, and color pigment, complying with NTMA "Guide Specification for Polyester Terrazzo".
  - 2.5.4 Epoxy Resin Terrazzo Matrix: Thermosetting, amine-cured epoxy resin and hardener mineral filler, and color pigment, complying with NTMA "Guide Specification for Epoxy Terrazzo."
  - 2.5.5 Conductive Terrazzo with Resinous Matrix: Electricity conductance shall conform to resistance levels established by the UL 779.
- 2.6 Precast Terrazzo: Precast terrazzo base and stair units shall comply with NTMA.



## 09000 - Finishes

- 2.7 Sealer: Colorless, slip-and stain-resistant, non-yellowing penetrating sealer that will not disturb color or physical properties of terrazzo surface; pH factor between 7 and 10.
- 2.8 Plywood: PS-I, "C-C EXT-APA" or "Underlayment C-C Plugged EXT-APA", 3/4 inch thick unless otherwise noted.
- 2.9 Nails: Fed. Spec. FF-N-IO5 annular, screw or ring type.
- 2.10 Elastomeric Sheet: 40 mil thick extruded, homogeneous, waterproof, impervious, nonplasticized chlorinated polyethylene sheet, complying with ASTM C 156
- 2.11 Curing Materials:
- 2.11.1 Polyethylene Film: Non-staining type.
- 2.11.2 Paper: Non-staining, heavy building paper.
- 2.11.3 Curing Compound: Liquid membrane-forming compound, complying with ASTM C 309, Type I.
- 2.12 Cleaner: Neutral liquid chemical cleaner, biodegradable, free from crystalline salts, phosphate or water soluble alkaline salts, formulated for terrazzo, pH factor between 7 and 10.
- 2.13 Terrazzo Accessories:
- A. Divider Strips: White metal alloy - 1 1/4 inches deep by 1/4" thickness or as otherwise indicated on drawings.
- B. Accessory Strips: White metal alloy to match width of divider strips, unless otherwise indicated for the following types of accessory strips:
1. Base bead and cove base dividers.
  2. Channels to receive abrasive inserts.
- C. Control Strips: Double or split units, 1/8" wide of same material and color as divider strips with 1/8" wide full-depth filler laminated between strips:
1. Filler: Elastomeric sealant.
- D. Cleaner: Neutral, liquid cleaner, recommended by sealer manufacturer for type of terrazzo used complying with all NTMA requirements.
- E. Floor Sealer: Penetrating type, free from harmful alkali or acid content, specially prepared for the terrazzo trade. Shall not discolor or amber. Shall produce a slip resistant surface.
- 2.14 Mixes:
- A. Underbed: comply with NTMA recommendations: One part Portland Cement and four to five parts clean, sharp sand. Mix with sufficient water to produce workability at as low a slump as possible.
- B. Terrazzo Toppings:
1. Standard Topping: 200 pounds of marble chips per 94 pound bag of white portland cement. Chips and cement to be identical to those in approved samples or selected from NTMA color plates.



2. Color pigment, if required, is to be mixed in with the dry ingredients. When thoroughly mixed, add (5) five gallons of water per bag of cement. Adjust amount of water to allow for water present in marble chips, if necessary. Use consistent proportion of water in water in each batch mixed. Comply with all NTMA requirements for mixes specified.

### 3.0 EXECUTION

- 3.1 Preparation: Clean and prepare substrate to comply with NTMA specifications for type of terrazzo application indicated. Clean area to receive terrazzo of loose chips and all foreign matter. Grind concrete substrate as required to provide surfaces within tolerances required by NTMA.
- 3.2 Installation:
  - 3.2.1 Comply with NTMA and manufacturer's recommendations for proportioning mixes, for installation of strips, and for placing, curing, grinding, grouting, and finishing.
  - 3.2.2 Provide terrazzo bases, thresholds, stair treads, and landings as required.
  - 3.2.3 Install Divider and Accessory Strips in an adhesive setting bed, without voids below strips. Provide mechanical anchorage for adequate attachment of strips to substrate.
  - 3.2.4 Provide Control Joints by installing angle type divider strips back-to-back with neoprene rubber filler cemented between strips, flush with finish floor.
  - 3.2.5 Provide for Expansion Joints by installing angle type divider strips back-to-back, with removable filler of the width shown (but not less than 1/4 inch wide) between strips.
  - 3.2.6 Install Abrasive Inserts where required.

END OF SECTION 09400



## 09000 - Finishes

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### SECTION 09410

### TERRAZZO TILE

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of terrazzo tile. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturers recommendations. Demolition and removal of materials shall be required to support the work.
- 1.1 RELATED SECTIONS
- |    |                        |               |
|----|------------------------|---------------|
| A. | Terrazzo               | Section 09400 |
| B. | Resilient Flooring     | Section 09660 |
| C. | Cast-in-Place Concrete | Section 03300 |
- 1.2 REFERENCES
- A. The following is a list of publications referenced in this section:
1. American Society for Testing and Materials (ASTM) - latest edition.  
ASTM E84 - Test methods for surface Burning Characteristics for Building Materials.  
ASTM E648 - Test method for critical Radiant Flux of Floor Covering Systems using a radiant heat energy source.  
ASTM E662 - Specific Optical Density of Smoke Generated by Solid Materials.
  2. Underwriters Laboratories, Inc. (UL) Fire Resistance Directory.
- 1.3 SUBMITTALS
- A. General  
Refer to General Conditions and General Requirements for procedures to be followed.
- B. Product Data:  
Submit manufacturers specifications and technical data for precast terrazzo tile and accessories; including manufacturers printed installation instructions.
- C. Samples:
1. Initial Selection: Submit manufacturers samples in the form of actual sections of tile and accessories to the architect. Samples are to include manufacturers full range of color and patterns available.
  2. Verification prior to installation: Submit FULL SIZE samples of all types, colors and patterns specified, indicating full range of pattern and color variations.
- D. Material Certificates:





Submit copies of manufacturers recommended maintenance instructions for precast terrazzo tile and accessories.

E. Maintenance Instructions:

Submit copies of manufacturers recommended maintenance instructions for precast terrazzo tile and accessories.

1.4 TEST REPORTS

The precast terrazzo tie units shall conform to the following test criteria as outlined by the manufacturer.

1.5 QUALITY ASSURANCE

A. Qualifications:

Installer is to be a firm who has at least three years of experience with the installation of precast terrazzo tile and has successfully completed installations of a similar size and scope as specified in this section.

B. Regulatory Requirements

1. Work of this section shall confirm to all requirements of the Corpus Christi Army Depot Building Code and all applicable regulations of other governmental authorities.

2. Fire Test Performance:

Provide precast terrazzo tile which complies with the following fire test performance criteria as determined by an independent testing laboratory acceptable to authorities having jurisdiction:

a. Critical Radiant Flux (CRF) : Not less than the following rating per ASTM E 0.45 watts per sq. cm.

C. Single Source Responsibility:

Obtain precast terrazzo tile from a single manufacturer including all recommended primers, adhesives, sealants and leveling compounds.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in original, unopened packages, containers or bundles bearing brand name and identification of manufacturer.

B. Store all materials inside, under cover in a manner to keep them dry, protected from weather, direct sunlight, surface contamination, corrosion and damage from construction traffic causes.

1.7 PROJECT CONDITIONS

A. Maintain minimum temperature of 70 degrees F in spaces to receive precast terrazzo tile, for at least 48 hours after installation. Store materials in space where they will be installed for at least 40 hours before starting installation.

B. Install terrazzo tile and accessories after other finishing operations, including paintings, have been completed.



## 09000 - Finishes

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- C. Do not install tile on concrete slabs until they have been cured and are sufficiently dry to achieve bond with adhesive, as determined by the tile manufacturers recommended bond and moisture test.

### 1.8 MAINTENANCE

#### A. Extra Materials

After completion of the work, deliver to the Contracting Officer, extra terrazzo tile, as maintenance materials. Furnish maintenance materials from same manufactured lot as materials installed, and enclose in protective packaging with appropriate identifying labels.

- 1. Furnish not less than one box of tile for each fifty boxes or fraction thereof, for each type, color pattern and size of tile installed.

### 2.0 PRODUCTS

#### 2.1 MANUFACTURERS

Subject to compliance with requirements specified provide products of the following manufacturer.

- a. Fritz Chemical Company
- b. or approved equal

#### 2.2 TERRAZZO TILE

##### A. General

Terrazzo tile shall consist of marble chips embedded in a flexible thermoset resin matrix, and shall be nominally 12" x 12" x 3/16" thick or as otherwise indicated on drawings. The tile shall have a smooth polished finish with a random distribution of chips.

##### B. Types:

Tile shall be one of the following types, as indicated on the drawings, as supplied by manufacturer or as otherwise indicated.

- 1. "Classic 300 series"
- 2. "Classic CL-1000 series"
- 3. "Custom 100 series"
- 4. "Custom 700 series"
- 5. "Renaissance 800 series"

##### C. Colors and Patterns:

Tile shall be of color and pattern as indicated on drawings or as selected by the Architect from manufacturers standards.

### 2.3 ACCESSORIES

#### A. Adhesives (Cements)



Waterproof, stabilized type as recommended by the tile manufacturer for materials and substrate conditions unique to specific application.

B. Concrete Slab Primer

Non-staining type as recommended by manufacturer.

C. Self-Leveling and Patching Compounds

Type as recommended by terrazzo tile manufacturer.

3.0 EXECUTION

3.1 SURFACE CONDITIONS

A. General

Prior to the installation of the work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may commence.

B. Inspection

1. Installer shall inspect all subfloor surfaces to comply with manufacturers installation instructions. Slab surfaces shall be dry, smooth, free of dust, paint, grease and all other foreign materials.
2. Installer is to perform bond and moisture tests on subfloors to determine if surfaces are sufficiently cured and dry as well as to determine if residual curing compounds are present.
3. Installer is to coordinate all work with that of other trades prior to installation so that no discrepancies may exist with installation of doors, frames, saddles, floor drains or any materials which would interfere in any way with the installation of terrazzo tile and underlayment material.
4. Start of work constitutes acceptance that all conditions are satisfactory.
5. Spaces and areas where flooring is being installed shall be closed to traffic and other trades until flooring has set.
6. Protect finished installation at all times. Contractor will be held responsible for all damage to flooring until final acceptance.

3.2 PREPARATION

A. Subfloor Surfaces

1. Use leveling and patching compounds - recommended by the tile manufacturer for filling small cracks, holes and depressions in subfloors.
2. Remove coatings from subfloor surfaces such as curing compounds incompatible with adhesives, paints, oils, adhesives, waxes and sealers that would prevent a positive adhesive bond.
3. For work in existing buildings, subfloor surface is to be inspected and leveled with a self-leveling compound to establish a level surface compliance with manufacturers specifications.



## 09000 - Finishes

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- B. Vacuum or broom clean existing surfaces prior to installation.
- C. Apply concrete slab primer specified for application to subfloor surface directions prior to application of adhesive, in accordance with manufacturers directions.

### 3.3 INSTALLATION

- A. General
  - 1. Comply with manufacturers instructions for terrazzo tile installation.
  - 2. Scribe, cut and fit tile to all permanent fixtures built-in furniture cabinets, pipes, outlets and permanent columns, walls and partitions.
  - 3. Maintain all reference markers openings marked on subfloor for future cutting by repeating on finished terrazzo floor.
- B. Installation of Tile
  - 1. Lay tile from center marks established with principal walls discounting minor offsets, so that tile at opposite edges of room area of equal width. Adjust as necessary to avoid use of cut widths less than one half tile at perimeters. Lay tile square to room axis, unless otherwise specified in drawings.
  - 2. Match tiles for color and pattern by using tile from cartons in the same sequence as manufactured and packaged, if so numbered broken, cracked or chipped tiles will not be acceptable.
  - 3. Adhere tile flooring to substrates using full spread of adhesive applied in compliance with tile manufacturers directions. Do not subject floors to traffic until adhesive is dry and hard, between 24 and 72 hours after installation.

### 3.4 CLEANING AND PROTECTION

- A. Upon completion of installation and curing of adhesive, clean floors in accordance with manufacturers instructions.
- B. Remove all excess adhesive, dirt stain and all other foreign material. Leave floor in perfect condition.
- C. Protect flooring from damage prior to final inspections, using manufacturers directions.
  - 1. Apply protective sealer to flooring surface as recommended by tile manufacturer.

END OF SECTION 09410



## SECTION 09510

### ACOUSTICAL CEILINGS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of acoustical units in suspended ceilings. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.1 Submittal:
- A. Shop Drawings:
1. Complete layout of installation showing size and pattern of tiles, and complete details of suspension system for approval.
  2. Indicate recessed lighting fixtures, access doors, air diffusers and grilles.
- B. Samples:
1. Mineral Fiber Tile - Three of each type.
  2. Metal Pan - Three of each type.
  3. Lay-in - Three of each type.
  4. Approved prior to erection.
- 1.2 Extra Stock: Deliver to the Contracting Officer one (1) box of each type containing approximately sixty (60) square feet properly labeled.
- 1.3 Not Used
- 1.4 Guarantee: Work showing any of the following defects within the one year guarantee period specified in the Contract shall be corrected as directed by the Contracting Officer.
- 1.5 Manufacturer: To match existing or as directed by the Contracting Officer
- 2.0 PRODUCTS:
- 2.1 Materials:
- A. Mineral Fiber Tile (Incombustible):
1. Materials shall conform to "Architectural Acoustic Materials" latest edition.
  2. Location and extent will be as directed by the Contracting Officer..
  3. 5/8" thick panels.
- B. Aluminum Metal Pans (Incombustible):
1. Noise Reduction Coefficient (ASTM-C423-60T): 0.80 Min.



## 09000 - Finishes

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2. Aluminum alloy 3003-H 14; .032 thick; perforated and unperforated: lacquered mill finish. Portion of ceiling over kitchen range and over dishwasher, shall have unperforated pans.
3. Baked on white enamel finish to match existing or as directed by the Contracting Officer.
4. Mineral wool or glass fiber pads (1-inch thick), sealed in incombustible plastic (polyvinyl chloride) envelopes. Pads are required in perforated pans only, and shall be supported on non-corrosive metal spacer grids or be placed atop the pan flanges and lay perpendicular to them, resting on pad supports. In kitchen area use pads sealed in plastic envelopes.
5. Suspension system shall comply with Corpus Christi Army Depot Building Code Requirements.
6. Expansion bolts, rawl drives or other approved devices.

### C. Impaction Ceiling System:

1. Must absorb 30 g's of energy.
2. Must accept a force such as a basketball striking the ceiling plane with sufficient velocity to cause the panel to accelerate at a rate of 20 inches per second. The panel must also be capable of accepting the accelerating force required to rebound it back into proper position on the grid, then shall not break, crack, or fall out as a result of this or equivalent abuse.
3. all acoustical material must be accessible and removable for access into the plenum at any location.
4. Impaction Deceleration Clip shall be formed of spring steel to absorb impact, snapping panels back in place.
5. The exposed suspension components shall insure proper operation and rebound of the Impaction Deceleration Clip. The suspension components shall be Underwriters' laboratories labeled for two hour fire resistance rate.

### D. Adhesive (for Mineral Fiber Tiles):

Factory made product recommended by manufacturer of the tiles used.

### E. Primer:

Apply one of the following:

1. Chemical wash
2. Sizing
3. Adhesive base or primer

Method of preparation shall be in accordance with the recommendation of the Manufacturer of the acoustical cement.

### F. Ceiling Grid to match existing.

## 3.0 EXECUTION:



- 3.1 Job Conditions: Acoustical material shall be installed under conditions as outlined in the current bulletin of the Acoustical and insulation Materials Association "Job Conditions".
- 3.2 Preparation of Work: Examine the building before beginning work to determine that it is properly enclosed and the structure is in proper condition to receive acoustical materials and suspension system. Area shall be broom cleaned and uninterrupted for free movement of rolling scaffold. Do not proceed until satisfactory conditions prevail.
- 3.3 Installation:
- A. General:
    - 1. Install in patterns indicated, (balanced borders all sided) symmetrical or centered about center line or corridors, panels, fixtures, beam haunches, rooms, spaces.
    - 2. Cut as required for installation of electric fixtures, air diffusers, grilles, access doors.,
    - 3. On completion, the acoustic ceilings shall present a uniform plane surface, free from blemishes and imperfections.
  - B. Cementing of Tiles:
    - 1. Cement acoustic tile directly to concrete ceiling slab, between beam haunches, and to plaster or gypsum board ceiling with 4 spots of adhesive to each square foot of tile.
    - 2. Each spot of adhesive shall produce a surface of not less than 2" in diameter after tile has been pressed in place.
    - 3. Apply primer as specified herein to all concrete surfaces prior to cementing tiles in place.
  - C. Aluminum Metal Pan Ceilings:
    - 1. Complete installation (include all hangers, running bars, channels, clips, pans, sound absorption pads).
    - 2. Running or snap bars spaced as determined and supported by hanger assembly form anchorage devices spaced 4'-0" o max. secured to structure.
    - 3. Provide additional running or snap bar arrangements at mechanical installations, support with hangers secured to structure. Space hangers as required by running or snap bar installation.
    - 4. Provide two (2) aluminum pulls at each pan when required for loudspeakers, valves, dampers, access doors, etc.
    - 5. Install the frames
    - 6. After installation, clean metal pans of all soil marks in a manner and with materials recommended by the manufacturer.
    - 7. Deliver to the Contracting Officer one (1) box (containing approximately sixty (60) square feet) of metal pan units, properly labeled.
  - D. Impaction Ceiling System:



## 09000 - Finishes

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1. Prior to installation, provide a written quality assurance agreement, co-signed by the manufacturer, detailing the degree of impact resistance that he guarantees the ceiling will provide for one full year from date of installation.
2. Installation shall be in full accordance with manufacturer's instruction booklet in addition, recommendations outlined in ASTM Specification C636-69, and the current Bulletin of the Acoustical and Insulation Materials Association, consistent with UL requirements shall govern installation.
3. Impaction Deceleration Clip shall be positioned and installed according to the manufacturer's instructions, These clips must provide access to the plemun at any location.

END OF SECTION 09510





## SECTION 09530

### ACOUSTICAL INSULATION AND BARRIERS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of acoustical insulation and barriers. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
  - 2.1 Foil-Reinforced, Kraft-Faced, Mineral-Fiber Insulation shall be a faced insulation product designed to be used for thermal and acoustical insulation. Mineral fiber insulation shall be in accordance with Fed. Spec. HH-I-558, Form A, Class 1 or 2. Noise reduction coefficient (NRC) shall be not less than 0.55 for 1-inch thickness. Vapor transmission rate shall be not more than 0.02 perms. Surface burning characteristics shall be not more than a flame spread classification of 25, a fuel contribution of 50, and a smoke developed rating of 50, when tested in accordance with UL 723.
  - 2.2 Vapor Barrier Facing material shall be in accordance with Fed. Spec. HH-B-I00, Type I or II as required. Facing material shall be a laminate of aluminum foil and kraft-reinforced mineral fiber scrim.
- 3.0 EXECUTION: As recommended by the Manufacturer and directed by the Contracting Officer.

END OF SECTION 09530



## SECTION 09535

### SOUND ABSORBING PANELS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of sound absorbing panels. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Perforated Steel Panels shall be modular units, fabricated of 22 gauge zinc-coated steel, and perforated with holes comprising not less than 10 percent of the panel area. Panels shall be suitably stiffened in both directions in accordance with panel size. Panels shall be filled with 2 inch thick, 1.5 lbs/cu ft acoustical insulation meeting Fed. Spec. HH-I-558, Form B, Type 1, Class 7 and have a flame spread of 0-25 when tested according to ASTM E 84. Installed panel units with acoustical insulation shall have a minimum Noise Reduction Coefficient (NRC) of .70 when tested in accordance with ASTM C 423. Panel units shall be furnished with two coats of white baked on polyester paint on exposed surfaces and one coat on non-exposed surfaces.
- 2.2 Fiberglass Wall Panels shall be modular units, fabricated of 1-1/8 inch glass fiber board laminated to a non-woven needle-punched fabric. The panels shall conform to Class A (0-25) flame spread rating when tested according to ASTM E 84. The panels shall have a minimum NRC of .80 according to ASTM C 423. Panels shall be furnished with suitable wall fastening system.
- 2.3 Sound Attenuation Blankets shall be composed of mineral fiber of 4 lbs/cu ft density for 1 inch thickness and 3 lbs/cu ft density for greater than 1 inch thickness conforming to Fed. Spec. HH-I-521. Blanket r-value shall be 4 per inch and fire hazard classification shall be flame spread 15, fuel contribution 0 and smoke developed 0, complying with ASTM E 84.
- 3.0 EXECUTION:
- 3.1 Perforated Steel Panels shall be installed on ceiling suspension systems and wall furring systems that are compatible with perforated steel panels and that are already in place.
- 3.2 Fiberglass Wall Panels shall be installed on substrate wall surfaces that are clean, dry, and continuous, with no surface irregularities.

END OF SECTION 09535



## SECTION 09560

### WOOD STRIP FLOORING

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of wood strip flooring. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.1 Submittals:
- A. Samples:
    - 1. Two 24" lengths of finish flooring.
    - 2. Clips, channels, cushioning material, vapor proof membrane, underlayment of plastic foam.
    - 3. Mark samples with name of Contractor, project identification, and area where material is to be used.
  - B. Certificates: All pieces trade marked with MFMA emblem or contractor shall submit certificate of inspection in duplicate.
    - 1. Certificate to be issued by licensed inspector of MFMA.
    - 2. Cost of inspection borne by Contractor.
    - 3. One copy of certificate to accompany shipment.
    - 4. One copy delivered to the Contracting Officer..
- 1.2 Manufacturer:
- A. Robbins "Lock-Tite" - White Lake, Wisconsin
  - B. "Sta Loc" - Horner Flooring Co., Dollar Bay, Mich.
  - C. Or approved equal.
- 2.0 PRODUCTS:
- 2.1 Wood Strip flooring shall be manufactured from kiln-dried, plain-sawed, red oak lumber. Flooring shall be select grade, tongue and groove, end-matched, with manufacturer's standard channeling of back face of each strip. Size shall be 33/32" inch thick, 2-1/4 inches wide.
- 2.2 Maximum Moisture Content shall be 8 percent for wood strip flooring.
- 2.3 Finishing Materials for Job Finished Flooring:
- 2.3.1 Stain: Penetrating type non-fading wood stain.
  - 2.3.2 Wood Filler: Fed. Spec. TT-F-336.



## 09000 - Finishes

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- 2.3.3 Sealer: Penetrating type, pliable, wood-hardening finish/sealer.
- 2.3.4 Varnish: Alkyd resin varnish.
- 2.3.5 Urethane Finish: Fed. Spec. TT-C-542
- 2.3.6 Floor Wax: Liquid, solvent-type, slip-resistant, conforming to Fed. Spec. P-W-158.
- 2.4 Composition Cork Expansion Strip: Fed. Spec. HH-C-576, Type I-B, Class 2.
- 2.5 Nails shall be Fed. Spec. FF-N-105 screw or ring type, zinc coated.
- 2.6 Asphalt Primer shall comply with ASTM D 41.
- 2.7 Asphalt Saturated Felt shall be organic, 15-pound, unperforated, complying with ASTM D 226.
- 2.8 Membrane shall be 6 mil, carbonized polyethylene sheeting, complying with Fed. Spec. L-P-512.
- 2.9 Wood Sleepers shall be No. 1 common, fir, hemlock, spruce, or yellow pine complying with PS 20, with preservative treatment complying with AWPB LP-2.
- 2.10 Plywood Subflooring shall be PS 1, "C-D INT - APA," with exterior glue, or "C-C EXT - APA."
- 2.11 Hardboard shall comply with Fed. Spec. LLL-B-810 and CS251, specially made for underlayment, 1/4 inch thick.
- 3.0 EXECUTION:
- 3.1 Preparation:
  - 3.1.1 Wood Subfloors shall be renailed where loose. Where unsatisfactory wood subflooring is removed, replace with new exterior or underlayment grade plywood. Apply hardboard underlayment just before finish floor is to be installed. Nail plywood subfloors with screw type nails. Cover ground in crawl space with lapped and sealed 4 mil polyethylene or 55-pound rolled roofing, and cover subfloor with lapped layer of 15-pound asphalt saturated felt.
  - 3.1.2 Concrete Subfloors. Fill large cracks and holes in concrete structural floor slabs with a one part nonshrinking cement to three part sand grout with a latex or epoxy additive. test for dryness with a 3 percent solution of phenolphthalein in grain alcohol (97 percent). Sand or trowel smooth irregularities to within allowable tolerances of NOFMA Specification Manual. Apply primer to concrete subfloors avoiding separating the emulsion. Apply two applications of hot asphalt mastic and asphalt saturated felt, then apply and additional layer of asphalt mastic. Provide flat 2 x 4 sleepers, 18 to 30 inches long impregnated with an approved wood preservative an laid in additional asphalt mastic; or apply a polyethylene sheet moisture protection system consisting of two courses of 1 x 2 nailing strips with a layer of polyethylene between, the first course being treated with preservative and adhered to the slab in rivers of mastic supplemented by a 1-1/2 inch concrete nail every 24 inches.
  - 3.1.3 Treated Wood cuts shall be treated with the original preservative.
- 3.2 Installation of Wood Strip Flooring:
  - 3.2.1 General: Comply with NOFMA Specification Manual.
  - 3.2.2 Expansion Space: For straight running pattern flooring and depending upon the width of pattern to be laid (Usually the width of the room), provide approximately 1/2 inch of expansion space under base and base shoe along length of stripping, with approximately half as much space at ends of pattern.



## 09000 - Finishes

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- 3.2.3 Machine Sand installed unfinished flooring to remove offsets and non-level conditions.
  - 3.2.4 Field finish floors by applying a coat of wood paste filler and stain, if needed.
    - 3.2.4.1 Natural Finish: Apply two coats of sealer and two coats of floor wax.
    - 3.2.4.2 Varnish Finish: Apply three coats of floor varnish.
    - 3.2.4.3 Urethane Finish: Apply multiple coats of urethane finish to build a dry film thickness of 1.0 mil.
- END OF SECTION 09560



## SECTION 09570

### WOOD PARQUET FLOORING

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of wood parquet flooring. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation, procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Wood Parquet Flooring shall be kiln-dried, plain-sawed, red oak.
- 2.2 Laminated (Plywood) Wood. Block Flooring shall be prime grade, 12-inch x 12-inch x 1/2-inch nominal size, with manufacturer's standard urethane floor finish. Flooring shall comply with CS233 unless otherwise indicated and shall be tongue and grooved as required for laying in checkerboard pattern.
- 2.3 Slat Block Flooring shall be clear grade, factory-prefinished with manufacturer's standard penetrating floor sealer treatment. Flooring shall be 9 inches x 9 inches x 5/16 inch, square pattern, tongue and groove, square edge matching and shall comply with PS 27 unless otherwise indicated. Pattern units of flooring shall be factory-assembled and adhered to removable paper facing for shipment to the project, or with slats fastened together with metal splines on backs.
- 2.4 Solid Block Flooring: Wood parquet flooring shall be prefinished in factory. Flooring shall be prime grade, tongue and groove, square edge, matching.
- 2.5 Plastic Impregnated Parquet Flooring shall be manufacturer's standard fabrication of solid hardwood slat-block parquet flooring, which has been impregnated with acrylic plastic and treated by gamma radiation and factory-finished. Flooring shall be composed of 5/16-inch thick x 6-inch squares fabricated into 12-inch square blocks, square edged, tongued and grooved, with tongue and groove matching.
- 2.6 Adhesive/Mastic shall be polyvinyl acetate (PVA) or special mastic of type recommended by the flooring manufacturer and complying with flammability and environmental control regulations.
- 2.7 Finish Materials for Unfinished Flooring:
- 2.7.1 Stain. Penetrating type non-fading wood stain.
- 2.7.2 Wood Paste Filler: Fed. Spec. TT-F-336, pigmented if required.
- 2.7.3 Sealer: TT-S-176, Class I, for white oak and red oak, Class II for beech, birch, and hard maple.
- 2.7.4 Varnish: Alkyd resin varnish conforming to Fed. Spec. 17-V-10930
- 2.7.5 Urethane Finish: Moisture curing type, urethane finish conforming to Fed. Spec. TT-C-540.
- 2.7.6 Floor wax: Slip-resistant, conforming to Fed. Spec. P-W-00158, Type I, Class 2.
- 2.8 Composition Cork Expansion Strip: Fed. Spec. HH-C-576, Type I-B, Class 2.



- 2.9 Nails and Screws shall be recommended by NOFMA Specification Manual.
- 2.10 Concrete Primer: ASTM D 41.
- 2.11 Asphalt-Saturated Felt: ASTM D 226.
- 2.12 Hardboard Underlayment: Fed. Spec. LLL-B-810 and CS251.
- 3.0 EXECUTION:
- 3.1 Preparation:
  - 3.1.1 For Adhesive Application on Concrete Slab: Test for dryness with a 3 percent solution of phenolphthalein in grain alcohol (97 percent), examine concrete surfaces and grind irregularities to within allowable tolerances of NOFMA Specification Manual, and apply primer to concrete subfloors.
  - 3.1.2 For Adhesive Application on Wood Subflooring or Underlayment: Preparation of subflooring or underlayment shall be in compliance with the printed instructions of the flooring manufacturer.
  - 3.1.3 For Nailed Application on Wood Subflooring or Underlayment: Cover subflooring with a layer of 15-pound asphalt-saturated felt, lap all edges at least 2 inches, and turn felt up at least 2 inches behind baseboards.
  - 3.1.6 For Plastic Impregnated Parquet Flooring: Patch and level concrete subfloors with porous latex cement patching compound. If parquet is to be installed over existing synthetic floor or tongue and grooved subfloor wider than three and one quarter inches, a 1/4 inch plywood or untempered hardboard underlayment.
- 3.2 Installation:
  - 3.2.1 General: Comply with WSFI specifications for "Mosaic Wood Parquet Flooring," "Laminated Block Flooring," and "Herringbone Flooring" and with CS56 and CS233, as applicable to the flooring type required. where flammable adhesives are used, provide safety sparkproof fans When natural ventilation is inadequate; prohibit smoking, lighting matches, metal heel caps, or any other flame or spark producing device.
  - 3.2.2 Installation of Wood-Block Flooring on Concrete Slabs shall be by adhesive method.
  - 3.2.3 Installation on Wood Subflooring or Underlayment: Apply one layer of saturated felt over wood or underlayment in troweled adhesive, and apply wood blocks with at least two 7-penny spiral or screw type flooring nails per block.
  - 3.2.4 Installation of Plastic Impregnated Parquet Flooring: Install with special adhesive.
  - 3.2.5 Sanding: Machine sand installed unfinished flooring to remove offsets and non-level conditions.
  - 3.2.6 Field Finishing:
    - 3.2.6.1 Base Finish: On same day that final sanding, buffing, and sweeping have been completed, apply a coat of wood paste filler. Apply stain if needed, then apply two coats of sealer.
    - 3.2.6.2 Natural Finish: When floors are dry apply two coats of wax.
    - 3.2.6.3 Varnish Finish: Apply 3 coats of floor varnish.
    - 3.2.6.4 Urethane Finish: Apply urethane finish to build a dry film thickness of 1.0 mil.



## 09000 - Finishes

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END OF SECTION 09570





## SECTION 09580

### WOOD BLOCK INDUSTRIAL FLOORING

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of wood block industrial flooring. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
  - 2.1 Wood Block Creosoted Flooring shall be Yellow Pine, Douglas Fir, or Upland Oak, preservative-treated, and in accordance with ASTM D 1031. Blocks shall be end-grain lumber with beveled corners and shall be 2, 2 1/2, or 3 inches thick, 3 inches wide, and 6 inches long.
  - 2.2 Wood Block Natural Finish Flooring shall be yellow pine or upland oak, preservative-Treated. Wood blocks shall be of the species, quality, and size described in ASTM D 1031. Blocks shall be end-grain lumber with beveled corners and shall be 2 inches thick, 3 inches wide, and 6 inches-long.
  - 2.3 Primer, Adhesive, and Filler shall be provided for wood block creosoted flooring.
  - 2.4 Flexible Filler and Clear Industrial Sealer and Finish Coating shall be provided for wood block natural finish flooring.
- 3.0 EXECUTION:
  - 3.1 Preparation: Before any work under this section is begun, all defects such as rough or scaling concrete, low spots, high spots, and uneven surfaces shall have been corrected and all damaged portions of concrete slabs shall have been repaired. If concrete curing compounds or surface sealers have been applied to the concrete slabs, they shall have been entirely removed from the slabs.
  - 3.2 Installation:
    - 3.2.1 For Wood Block Creosoted Flooring, a coat of priming oil shall be applied to the concrete slab. After the priming oil has dried, a squeegee coat of hot adhesive shall be applied. When the adhesive has hardened, the blocks shall be laid tightly together with the grain vertical. After the floor has been laid, two coats of filler shall be applied by squeegee. Expansion joints shall be provided.
    - 3.2.2 For Wood Block Natural Finish Flooring, the Joints shall receive filler and multiple coats of clear sealer and finish coating. Number of coats and method of application shall be adjusted to seasonal conditions.
  - 3.3 Marking Lines: Floor surface in areas to receive lines shall be cleaned by scarification or by wire brushing. At least two coats of a marking material compatible with flooring materials shall be applied with suitable brush or spraying machine. The minimum total thickness of the marking lines shall be 4 mils.

END OF SECTION 09580



## SECTION 09590

### GYMNASIUM FLOORING

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of gymnasium flooring. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Flooring shall comply with MFMA grading rules. Wood strips shall be second grade or better, edge cut, hard maple (*acer saccharum*), pressure treated, and kiln dried.
- 2.2 Asphalt Primer: ASTM D 41.
- 2.3 Asphalt Saturated Felt: Organic, 15 pounds unperforated, complying with ASTM D 226.
- 2.4 Membrane: 6 mil, carbonized polyethylene sheeting, complying with Fed. Spec. L-P-512.
- 2.5 Wood Sleepers: No. 1 common, fir, hemlock, spruce, or yellow pine complying with PS 20, with preservative treatment complying with AWPB LP-2.
- 2.6 Wood Trim: Provide wood baseboard molding, base shoe molding, and stair risers of same species as the wood flooring. Provide wood stripping, nosings, saddles, and thresholds, of same species and cut as the wood flooring.
- 2.7 Fibrated Kraft Building Paper: Fed. Spec. UU-B-790, Type I, Grade D.
- 2.8 Plywood Subflooring: PS1-74, "C-D INT-APA," with exterior glue; or "C-C EXT-APA."
- 2.9 Hardboard: Fed. Spec. LLL-B-810 and CS251, specially made for underlayment, 1/4 inch thick.
- 2.10 Nails: Fed. Spec. FF-N-105 annular, screw or ring type, zinc-coated.
- 3.0 EXECUTION:
- 3.1 Installation: Comply with MFMA standards and WSFI standards
- 3.2 Expansion Spaces: Provide space at walls and other obstructions, interruptions, and terminations of flooring. Cover spaces with base trim, saddles, and thresholds.
- 3.3 Resiliently-Mounted Subflooring System: Install two layers of 1/2 inch plywood subflooring over moisture barrier and primed substrate. Nail gymnasium flooring to subflooring.
- 3.4 Steel Channel Sleeper System: Install moisture barrier over primed substrate. Nail channel sleepers to substrate over resilient channel backer, spaced 12 inches on center. Lay resilient insulation boards in a continuous course between channel sleepers. Fasten gymnasium flooring with flooring clips.



## 09000 - Finishes

- 3.5 Resiliently-Mounted Wood Sleeper System: Install 2 inch by 3 inch wood sleeper units at 12 inches o without anchorage over moisture barrier and primed substrate. Nail gymnasium flooring to wood sleepers.
- 3.6 Wood Subflooring and Sleeper System: Anchor sleeper clips to primed substrate, 24 inches o , for running sleepers at 16-inch spacing. Flood-coat substrate with 1/8-inch thick pour of hot asphalt. Shim 2 inch by 3 inch wood sleepers level and grout with 1:3 Portland cement- sand grout. Nail clips to sleepers at each juncture. Nail subflooring on sleepers. Cover subflooring with 30-pound, asphalt-saturated felt, with lapped seams. Install wood strip gymnasium flooring to subfloor.
- 3.7 Steel Spline Flooring on Vapor Barrier System: Prime concrete slab with asphalt primer before applying two layers of 15-pound, asphalt-saturated felt in asphalt mastic. Cover top layer of felt with a smooth continuous layer of asphalt mastic at least 1/8 inch thick. Lay 12-inch wide continuous strips of finish flooring firmly in asphalt mastic interlocking with saw-toothed steel splines into the slotted ends.
- 3.8 Steel Spline Flooring on cork Underlayment System: Vaporproof slabs on grade as described in Section 3.7. Install 1/2-inch thick corkboard or 1/2-inch thick corkroll underlayment in 1/8 inch of asphalt mastic. Over corkboard, trowel on an additional coat of mastic, 1/8 inch thick. Lay 12-inch wide continuous strips of finish flooring firmly in asphalt mastic interlocking with saw-toothed steel splines into the slotted ends.
- 3.9 Sanding: Machine sand with coarse, medium, and fine grades of sandpaper, followed by disc sanding with 000 sandpaper. Clean with power vacuum. Proceed immediately with finish.
- 3.10 Finishing: Apply floor sealer (2 coats). Apply as many coats of gym floor finish as needed to build a minimum dry film thickness of 3 mils. Machine buff with steel wool.

END OF SECTION 09590



## SECTION 09598

### SOFTWOOD FLOORING

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of softwood flooring. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
- 2.1 Douglas Fir wood strip flooring, kiln-dried, vertical grain, complying with the requirements of WCLB for Grade C and better flooring.
- 2.2 Southern Pine wood strip flooring, kiln-dried, edge grain, complying with the requirements of SPIB for Grade C and better.
- 2.3 Matching: Tongued and grooved, and end matched.
- 2.4 Pressure Treatment: Where flooring is exposed to the exterior, provide AWPB LP-2 pressure treatment after manufacture of flooring, followed by drying to required moisture content.
- 3.0 EXECUTION:
- 3.1 Plank Flooring: For strip flooring of face width over 3-1/4 inches (plank flooring), install two counter-set nails at each end of each piece and spaced not more than 32 inches along length of each piece. Fill holes with matching wood filler.
- 3.2 Treated Wood: Whenever treated wood flooring must be cut for installation, treat the cut with the preservative used in the original treatment immediately after cutting.

END OF SECTION 09598



## SECTION 09651

### RESILIENT FLOORING - CEMENTITIOUS UNDERLAYMENT

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of cementitious underlayment for resilient flooring. Product shall match existing material and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS: Cementitious underlayment shall be one of the following factory-mixed types.
  - 2.1 Thoro self leveling cement or approved equal
  - 2.2 Magnesium Type: Mixture of sand, magnesium, cement, and/or gypsum. Add water before using.
  - 2.3 LATEX COMPOUND: Equal to the following synthetic rubber base compounds:
    1. Tile-Tex Latex Underlayment by Flintkote
    2. Miracle Latex Scaler, Miracle Adhesive Co.
    3. Universal Kenpatch, Kentile Inc.
    4. Dex-O-Tex, Crossfield Products Co.Composition shall be sure that the material can be troweled to a feather edge.
- 2.4 Polyvinyl Acetate Type: Polyvinyl acetate resins, cement, gypsum, and sand mixtures.
- 2.5 Epoxy Type: Two-component epoxy type that merely requires mixing of the two parts in compliance with manufacturer's instructions.
- 2.5 Oxychloride Type: Mixture with cement and with or without magnesium.
- 3.0 EXECUTION:
  - 3.1 Preparation:
    - 3.1.1 On Wood Subfloors lay 15-pound saturated felt in opposite direction to floor boards. Lap edges three inches.
    - 3.1.2 Place Metal Lath nailed at 6-inch centers over felt.
  - 3.2 Installation:
    - 3.2.1 Install Cementitious Underlayment in strict compliance With instructions for the type of system used.
    - 3.2.2 Where Feather Edges less than 1/4 inch thick are required, use a latex type underlayment for such thin parts of the underlayment.
    - 3.2.3 On Concrete Surfaces apply latex or polyvinyl acetate liquid as a bonding agent before installing underlayment.



## 09000 - Finishes

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END OF SECTION 09651



## SECTION 09660

### RESILIENT FLOORING

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of resilient flooring. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.1 Samples:
1. Two (2) samples of each color (V.C.T.; sheet vinyl flooring).
  2. Two (2) one quart cans adhesive, each type required.
  3. Two (2) representative samples of edging strip 12" long.
  4. All for approval prior installation.
  5. Mark samples with name of Contractor, project identification, and area where materials are to be used.
- 1.2 Extra Stock
1. Furnish additional floor covering materials for replacement and maintenance.
  2. Furnish materials of each size, color pattern, and type of material included in the work.
  3. Furnish materials at the rate of one (1) carton for each 1000-1500 sq. ft.
- 1.3 Quality Assurance:
- A. Qualifications:
1. Manufacturer: Provide each type of resilient flooring and accessories as produced by a single manufacturer, including recommended primers, adhesives, sealants, and leveling compounds.
  2. Installer: A firm with not less than 5 years of successful experience in the installation of specified materials.
- B. Certifications:
1. Furnish manufacturer's certification from an independent testing laboratory acceptable to authorities having jurisdiction, that resilient flooring complies with fire test performance requirements.
  2. Furnish certification from flooring installer that the substrate surfaces have been examined and are acceptable for installation of the Work of this Section.



## 09000 - Finishes

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C. Fire Test Performance: Provide resilient flooring which complies with the following performance criteria as determined by an independent testing laboratory acceptable to authorities having jurisdiction.

1. Critical Radiant Flux (CRF): Not less than the following rating as per ASTM E 648.
2. Flame Spread: Not more than 75 as per ASTM E84.
3. Smoke Developed: Not more than 450 as per ASTM E84.
4. Smoke Density: Not more than 450 as per ASTM E662.

### 2.0 PRODUCTS:

#### 2.1 Resilient Tile Flooring:

Vinyl-Composition Tile: Fed. Spec. SS-T-312, Type IV, 12 inches by 12 inches by 1/8 inch thick.

Armstrong Stonex Premium Excelon Vinyl Composition Tile, or approved equal.

#### 2.2 Resilient Sheet Flooring:

Sheet Vinyl Flooring:

1. Fed. Spec. L-F-475A (3), Type II, Grade A.
2. 6'-0" Wide. .080" gauge.

Non-Slip Vinyl composition Tile

1. Fed. Spec. SS-T-312, Type I
2. Carborundum grits embedded securely into top surface.
3. 12-inch x 12-inch x 1/8-inch thick.

#### 2.3 Vinyl Base

1. Compression type.
2. 4" high, 1/8" thick (tolerance  $\pm .005$ ").
3. Top corner rounded, bottom coved, arranged for above floor application.
4. Colors as selected.

#### 2.4 Adhesives

1. Type as recommended by manufacturer for particular resilient flooring and base.
2. Adhesive suitable for adhesion plaster, masonry, metal or wood, waterproof after drying to resist action of water.

#### 2.5 Edging Strip

1. Brass or White alloy metal.
2. Under flange type.

#### 2.6 Vinyl Saddles





1. Flush or tapered as indicated.
2. Thickness to suit abutting floor covering material.
3. Colors as selected.
- 2.7 Plywood: PSI, "C-C EXT-APA" or "UNDERLAYMENT C-C Plugged EXT-APA," 3/4 inch thick unless otherwise noted for subfloors and 1/4 inch thick for underlayment.
- 2.8 Nails: Fed. Spec. FF-N-105, annular, screw or ring type.
- 3.0 EXECUTION:
- 3.1 Preparation:
  - 3.1.1 Concrete Floor Surfaces: Fill large cracks and holes in concrete structural floor slabs with one part nonshrinking cement to three part sand grout with a latex or epoxy additive. Level floors and fill small cracks and holes in concrete or underlayment with a commercial latex or epoxy floor patching compound.
  - 3.1.2 Wood Floor Surfaces: Fill knot holes, cracks wider than 1/8 inch, and holes larger than 1/4 inch in diameter with a crack filler as specified for this application. All ridges or other uneven surfaces shall be planned, scraped, or sanded smooth. Nail heads shall be set. Renail wood underlayment and sub-floors where loose using annular or ring type coated nails. Remove and replace rotted, broken, or otherwise unsatisfactory wood subflooring and all other defective materials with new exterior grade plywood of equivalent thickness.
- 3.2 Installation: General
  - A. Install resilient flooring materials in compliance with manufacturer's latest printed instructions.
  - B. Scribe cut and fit resilient flooring to permanent fixtures, pipe trench covers, built-in cabinets, pipes, outlets, columns, walls and partitions.
  - C. Tightly cement resilient flooring to subbase without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks or other surface imperfections.
  - D. Hand roll flooring at perimeter of each covered area to assure adhesion.
  - E. Spaces and areas where flooring is being installed shall be closed to traffic and other trades until flooring has set.
  - F. Protect finished installation at all times. Contractor will be held responsible for all damage to flooring until final acceptance.
- 3.3 Installation of Tile Floors:
  - A. Lay tile from center marks established with principal walls, discounting minor offsets, so that tile at opposite edges of room area is of equal width. Adjust as necessary to avoid use of cut widths less than 1/2 tile at room perimeters. Lay tile square to room axis.
  - B. Match tiles for color and pattern by using tile from cartons in same sequence as manufactured and packaged if so numbered. Cut tile neatly around all fixtures. Broken, cracked, chipped, or deformed tiles are not acceptable.
    1. Lay tile in patterns indicated and as indicated and as directed by the Contracting Officer.



## 09000 - Finishes

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2. Lay adjacent tile with direction of texture opposite adjoining tiles.

C. Adhere tile flooring to substrates using full spread of adhesive, applied as directed by tile manufacturer.

### 3.4 Installation of Solid Vinyl Sheet Flooring:

A. Lay sheet flooring to provide as few seams as possible with economical use of materials. Match edges for color shading and pattern at seams.

B. Adhere sheet flooring to substrates using method approved by flooring manufacturer for applicable type of sheet flooring and substrate.

C. Prepare seams in vinyl sheet flooring with manufacturer's special routing tool and heat weld with vinyl thread or matching PVC rods.

D. Provide integral flash cove base where shown on drawings, including cove support strip and metal top edge strip.

### 3.5 Installation of Non-Slip Vinyl Sheet Flooring: Installation similar to Art. 305 for Solid Vinyl Sheet Flooring, in addition to the following:

A. Caulk around penetrations with manufacturer's mastic. Mastic color shall match vinyl flooring.

B. Do not apply sealer or wax on flooring. Machine scrub, using nylon or hard bristle brushes and floor cleaner recommended by the manufacturer.

### 3.6 Installation of Accessories:

A. Apply wall base to walls, columns, pilasters, casework and other permanent fixtures in rooms or areas where base is required. Install base in lengths as long as practicable, with corners fabricated from base materials with mitered or coped inside corners and preformed external corners. Tightly bond base to substrate throughout length of each piece, with continuous contact at horizontal and vertical surfaces.

1. On masonry surfaces, or other similar irregular substrates, fill voids along top edge of resilient wall base with manufacturer's recommended adhesive filler material. Color to match base material.

B. Place resilient edge strips tightly butted to flooring and secure with adhesive. Install edging strips at edges of flooring which would otherwise be exposed. Locate strips under doors.

C. Apply resilient accessories to areas as indicated and in strict accordance with manufacturer's installation.

D. Install wall base continuous around external corners and lap a minimum of 6 inches.

### 3.7 Cleaning:

A. Remove any excess adhesive and other surface soiling from face of installed materials with cleaning agents recommended by the manufacturer of the material being cleaned.

B. Do not wash floor until time period recommended by resilient flooring manufacturer has elapsed to allow resilient flooring to become well set in adhesive.



## 09000 - Finishes

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- 3.8      Protection:    Protect resilient flooring against damage by covering with "kraft" building paper until inspection for substantial completion.

END OF SECTION 09660



## SECTION 09670

### FLUID-APPLIED RESILIENT FLOORING

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of fluid-applied resilient flooring. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
- 2.1 Polyurethane Elastomer Flooring:
- 2.1.1 Polyurethane Elastomer Flooring shall be a poured-in-place urethane recreational type flooring surface system composed of a two-part urethane component system. Components shall be blended and poured as a liquid onto a prepared base. Primer material to provide adhesion of the polyurethane to the base shall be as recommended by the flooring manufacturer. Line paints shall be polyurethane. Flooring color, thickness, durometer hardness, and painted lines shall be as required by the Contracting Officer.
- 2.1.2 Physical Properties: Material weight shall be approximately 0.83 pound per square foot per 1/8-inch thickness. Tensile strength shall be 200-600 psi in accordance with ASTM D 412. Hardness range shall be 55-65 Shore A-2 in accordance with ASTM D 2240. Elongation shall be limited to 150-350 percent in accordance with ASTM D 412. Compression set shall be 90 percent immediate recovery after 72 hours at 50 percent compression at 72° F in accordance with ASTM D 395. The material shall provide complete resistance to fungus.
- 3.0 EXECUTION: Base surface preparation shall be in strict accordance with polyurethane flooring manufacturer's recommendations. Cracks and construction joints shall be filled flush with materials recommended by the manufacturer.

END OF SECTION 09670



## SECTION 09675

### CONDUCTIVE VINYL TILE FLOORING

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of conductive vinyl tile flooring. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
  - 2.1 Certificate of Conductance: Submit one copy of certificate signed by the Contractor, stating: "Conductive floors were tested by method prescribed in ANSI/UL 779 and were found to have a resistance of less than 1,000,000 ohms and greater than 25,000 ohms".
  - 2.2 Conductive Vinyl Tile: Floor covering shall be of solid, unlaminated construction, manufactured from highest grade materials, with surface smooth, and free from foreign matter. Tile shall be resistant to the action of acids and other materials normally encountered in operating rooms. Tile shall comply with Fed. Spec. SS-T-312, Type III and shall be listed by Underwriters' Laboratories, Inc. Elements of tile shall be so proportioned that the electrically conductive components will not be more than 1/4 inch apart on the top surface.
    - 2.2.1 Tile Size: 1/8 inch by 12 inch by 12 inch tiles, micro-squared to ensure tight joints.
    - 2.2.2 Slab Size: 1/8 inch by 36 inch by 36 inch slabs.
  - 2.3 Conductive Adhesive: A two-part chemically setting, water resisting, epoxy adhesive specially formulated for installing conductive vinyl tile. Adhesive shall form a conductive field under tile without use of copper foil strips.
  - 2.4 Epoxy Caulking Cement used to seal the perimeter joint shall be a material recommended by the manufacturer of the flooring.
- 3.0 EXECUTION:
  - 3.1 Conductive Tile shall be installed by experienced mechanics under the supervision of factory-approved personnel. Install with conductive adhesive. Complete electrical grounding in compliance with the manufacturer's instructions.
  - 3.2 Lay Tile From Center Marks established with principal walls, discounting minor offsets, so that tile at opposite edges of the room are of equal width. Adjust as necessary to avoid use of cut widths less than 1/2 tile at room perimeters. Lay tile square to room axis, unless otherwise directed.
  - 3.3 Cleaning: Three days after installation, conductive vinyl tile floors shall be cleaned thoroughly. DO NOT apply wax to conductive flooring.
  - 3.4 Testing: After completion of installation, conductive vinyl tile floors shall be tested by qualified technicians employed by the Contractor. Test shall be done in presence of the Contracting Officer. Testing procedure shall comply with ANSI/UL 779.



## 09000 - Finishes

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END OF SECTION 09675



## SECTION 09680

### CARPETING

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of carpeting. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.1 Manufacturers:
1. Contact the Contracting Officer for current list.
- 1.2 Requirements Of Regulatory Agencies: Methenamine Pill Test: Carpet shall meet or exceed U.S. Dept. of Commerce Standard- Federal Flammability Standard DOCFF-170.
- 1.3 Samples:
- A. Submit three (3) samples of carpet and padding 9" x 12" for approval, before any installation work is started.
  - B. Label samples, stating, color, weight/sq. yd. /density, pile height, location where to be installed (room and building) and manufacturer's name.
  - C. Colors are to be determined and shall match control samples.
- 1.4 Extra Stock: After acceptance of installation, deliver six (6) 12 x 12 inch swatches of each color and pattern of carpeting to Facility Manager for future use in patching. Securely wrap and label each package for proper identification.
- 1.5 Guarantee: Furnish a five (5) year unconditional guarantee covering satisfactory workmanship, materials and installation.
- 1.6 QUALITY ASSURANCE
- A. Installer Qualifications
    1. Experienced in the supervision of carpet installation with at least five years experience in this type of work.
    2. Actual work shall be done by qualified and experienced mechanics working under his supervision or under the supervision of an experienced workroom supervisor who has also been doing this type of work for five years.
  - B. Regulatory Requirements

Fire Performance Characteristics: Provide carpeting that has been tested for the following fire performance requirements, according to test method and inspecting agency having jurisdiction.

    1. Flammability: As follows:
      - a. Rating: Passing Methenamine Pill test.



## 09000 - Finishes

- b. Test Method: DOC FF1-1970.
  2. Critical Radiant Flux: As follows:
    - a. Rating: Not less than 0.40 watts per sq. centimeter.
    - b. Test Method: ASTM E648.
  3. Smoke Density: As follows:
    - a. Smoke Developed: Not more than 300 in first 4 minutes tested in flaming or non-flaming mode.
    - b. Test Method: ASTM E662.
- C. Certifications:
  1. Submit manufacturers certificate stating that materials furnished comply with or exceed all specified requirements.
  2. Submit certified independent laboratory testing data indicating that material meets requirements for Fire Resistance specified above.

### 2.0 PRODUCTS:

#### 2.1 Carpet ("Minimum Requirements")

- |                        |   |
|------------------------|---|
| 1. Face Yarn Content   | 70% Acrylic - 30% Modacrylic  |
| 2. Weave               | Tufted thru back  |
| 3. Pile Height         | 3/16-inch   |
| 4. Face Yarn Weight    | 28 oz./Sq. Yd.  |
| 5. Average Density     | 6160  |
| 6. Total Carpet Weight | 60.25 oz./Sq. Yd.   |
| 7. Gauge               | 1/8 or 1/10 (80 tufts/Sq. )   |
| 8. Backing             | Primary-Polypropeline<br>4.2502/Sq.Yd. Secondary Jute 8-oz.   |
| 9. Static Control      | Permanent control of static electricity<br>to a reading of less than 3000 volts<br>(3.0 kilovolts) at 20% relative<br>humidity at 70 F. |
| 10. Width              | 12 feet   |
| 11. Colors             | As selected by the Contracting Officer  |

#### 2.2 Padding: Rubberized, equal to Allen "Rubber - Loc 56" (56 oz. ) by Allen Industries.

#### 2.3 Adhesive:

As recommended by manufacturer of carpet for direct glue down applications. Comply with fire performance requirements for carpet.

##### 2.3.1 Seaming Cement

Hot-melt seaming adhesive recommended by carpet manufacturer, for taping seams and butting cut edges to form secure seams and prevent pile loss at seams.

##### 2.3.2 Edge Guard





Heavy duty vinyl carpet as guard as manufactured by Mercer Plastic Company of Orlando, Florida or approved equal, minimum 2" wide anchorage flange. Colors to be determined.

### 2.3.3 Reducing Strip

Solid heavy duty vinyl carpet reducing strip (tapered vinyl saddle) or half saddle as manufactured by Mercer Plastic Company of Orlando, Florida or approved equal, minimum 1/2 inch tapered. Colors to be determined.

### 2.3.4 Patching Compound

Type as recommended by carpet manufacturer.

### 2.3.5 Floor Filler

Type as recommended by carpet manufacturer.

### 2.4 Tackless Carpet Stripping: Water-resistant plywood stripping, with angular pins protruding from the top. Provide stripping with 2 rows of pins wherever the carpet width is less than 20 feet and with 3 rows of pins wherever the carpet width is less than 20 feet or more. Provide prenailed stripping, ready for anchorage to concrete or similar substrate.

### 2.5 Seam Thread: No. 18 waxed linen.

### 2.6 Masonry Nails: No. 9 (0.148 inch x 1 inch) hardened masonry nails, Fed. Spec. FF-N-105.

### 2.7 Latex Underlayment: One- or two-component, factory-mixed product containing powdered or liquid latex, cement, and other powders.

### 2.8 Crack Filler: Type and brand recommended by carpeting manufacturer.

### 2.9 Hardboard: CS251, untempered type specially made for use as underlayment, 3/16 inch or 1/4 inch thick.

### 2.10 Plywood: PS-I, "C-C EXT-APA" or "UNDERLAYMENT C-C Plugged EXT- APA", 3/4 inch thick unless otherwise noted for subfloors and 1/4 inch thick for underlayment.

### 2.11 Nails: Fed. Spec. FF-N-105 annular, screw or ring type.

## 3.0 EXECUTION:

### 3.1 Preparation:

#### 3.1.1 Fill Large Cracks and Holes in concrete structural floor slabs with a one-part, non-shrinking cement to three-part sand grout with a latex or epoxy additive. All ridges or other uneven surfaces shall be ground smooth; chalky or dusty surfaces shall be primed.

#### 3.1.2 Level Floors and fill small cracks and holes in concrete or underlayment with a commercial latex or epoxy floor patching compound.

#### 3.1.3 Wood Floor Surfaces: Knot holes, cracks wider than 1/8 inch, and holes larger than 1/4 inch diameter shall be filled with a crack filler as specified for this application. All ridges or other uneven surfaces shall be planed, scraped, or sanded smooth.

#### 3.1.4 Wood Underlayment and Subfloors shall be renailed where loose.



## 09000 - Finishes

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- 3.1.5 Rotted, Broken or Otherwise Unsatisfactory Wood Subflooring and all other defective materials shall be removed and replaced with new.
- 3.1.6 Undercut Wood Door Bottoms as required to allow clear door swing over newly carpeted areas.
- 3.1.7 GLUE-DOWN INSTALLATION
- A. Fit sections of carpet into each space prior to application of adhesive. Trim edges and butt cuts with seaming cement.
  - B. Apply adhesive uniformly, to comply with manufacturers instructions. Butt carpet edges tightly to form seams without gaps. Roll entire carpet area lightly to eliminate air pockets and ensure uniform bond. Promptly remove and adhesive from carpet by an approved method.
  - C. Join carpet with recommended seam reinforcing tape applied to underside of carpet with recommended hot melt seam adhesive. Extend seam reinforcing continuously along seam and 2" onto each piece being joined.
  - D. Allow glue-down installation a minimum of 48 hours to cure before subjecting it to any traffic, moving of furniture or final cleaning.
- 3.1.8 ADJUSTING
- A. Included as part of the work of this Contract is the provision that the Carpet Contractor repair seams, joints and edges if required, after installation is completed.
  - B. The Authority shall determine if and when this work is required, but it shall be within 12-months after final approval of finished installation.
  - C. Contractor will be notified fourteen (14) days prior to the time he would be required to return to the site for this repair work.
  - D. Provide Facility Manager with service telephone number.
- 3.1.9 CLEANING
- A. Immediately remove spots and smears of cement from carpet with solvent.
  - B. Upon completion of installation, remove all tools and equipment and dispose of all waste and excess materials. Carefully and thoroughly vacuum cleaner to the satisfaction of the Contracting Officer.
  - C. Contractor will be notified fourteen (14) days prior to the time he would be required to return to the site for this repair work.
  - D. Provide Facility Manager with service telephone number.
- 3.1.10 PROTECTION
- A. Upon completion and final inspection by the Authority, provide reinforced Kraft paper runners 36" wide at all traffic areas as directed by the Contracting Officer.
  - B. Prior to final inspection, no traffic will be allowed on the installed carpet.
- 3.2 Carpet Padding:



- A. Lay in largest possible lengths, using the minimum number of sections.
- B. Padding securely adhered to sub-floor with padding cement.
- C. All bubbles knee kicked out and a slight stretch applied to padding.
- D. Padding seams to be laid out so that carpet seams will not fall directly over seams.

3.3 Carpet:

- A. Install preferable one piece. However, if seams are necessary, they shall be sewn as per manufacturer's recommendation.
- B. Stretch carpet drum-tight in length and breadth, by use of knee-kickers and power stretchers.
- C. Install carpet on tackless strips.
- D. Included as part of the work of this Contract is the provision that the carpet contractor restretch, repair seams, joints and edges if required, after installation is completed.
- E. The Board shall determine if and when this work is required, but shall be within 12-months after final approval of finished installation.
- F. Contractor will be notified fourteen (14) days prior to restretch.
- G. Provide Facility Manager with service telephone number.

3.4 Clean-Up:

- A. Upon completion of installation, remove all waste and excess materials, all tools and equipment, and carefully and thoroughly vacuum clean the entire floor areas with an upright beater type vacuum cleaner, to the satisfaction of the Contracting Officer.
- B. All excess usable carpet pieces are to be left on the Job Site and placed in an orderly manner in area designated by the Facility Manager.

3.5 Protection: Traffic will not be allowed on installed carpet until after final inspection and acceptance.

END OF SECTION 09680



## SECTION 09720

### EPOXY FLOORING

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of epoxy flooring. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.1 Manufacturer's: Monile, Selby, Dur-A-Flex or approved equal.
- 2.0 PRODUCTS:
- 2.1 General: Component materials for any one flooring tape shall be from a single manufacturer. Cover bases of flooring material shall be provided if required.
- 2.2 Epoxy Quartz Chip Flooring shall be decorative floor surfacing system consisting of primer; topping including epoxy resin, hardener, and ceramic-coated quartz aggregate; and finish coat or coats. Topping, including aggregate, when tested in accordance with referenced standards, shall have a compressive strength of 9,800 psi (ASTM C 579), a flexural strength of 6,000 psi (ASTM C 580), a bond strength of 400 psi (ACI 503, Appendix A), and a water absorption rate of 0.06 percent (ASTM C 413). Tests of chemical resistance of cured resin, when immersed for 7 days in reagents (Fed. Std. 406, Method 7011), shall show no effect from ammonium hydroxide, carbon tetrachloride, citric acid, dimethyl formamide, formaldehyde (3 percent), heavy-duty detergent, heptane, hydrogen peroxide (28 percent), lactic acid, oleic acid, phenol solution, sodium carbonate (20 percent), sodium chloride (10 percent), sodium hydroxide (60 percent), sodium hypochlorite, sulfuric acid (30 percent), and urine.
- 2.3 Epoxy Flooring shall be industrial floor surfacing system consisting of primer; Lopping including epoxy resin, hardener, coloring agent, and selected fine aggregates; and finish coat or coats. Physical properties of topping, including aggregate, when tested in accordance with referenced standards, shall have a compressive strength of 7,500 psi (ASTM C 579), a tensile strength of 1,750 psi (ASTM C 307), a flexural strength of 3,000 psi (ASTM D 790), and a maximum thermal coefficient of linear expansion of 20 by  $10^{26}$  in/in/degrees F (ASTM D 696). The extent of burning shall be 0.25 inches maximum (ASTM D 635). Minimum bond strength shall be 200 psi, with 100 percent concrete failure (ACI 503, Appendix A). Abrasive resistance shall be 0.20 grams maximum (ASTM D 1044, 1,000 Grams, 1,000 Cycles). Impact strength, except topping bonded to concrete, shall be 0.05, with no chipping, cracking, or detachment of surfacing from concrete (MIL-D-3134, Para. 4.7.3). Tests of chemical resistance of cured resin when immersed 7 days in reagents (Fed. Std. 406, Method 7011), shall show no effect from acetic acid (5 percent), ammonium hydroxide (10 percent), citric acid (50 percent), cola syrup, fatty acid, motor oil (20W), hydrochloric acid (10 percent), salt water, sodium hydroxide (10 percent), sulfuric acid (10 percent), trisodium phosphate (5 percent), and water (distilled). There shall be only slight softening from ethyl alcohol (95 percent), jet fuel JP-4C, and mineral spirits. There shall be no effect but slight stain from nitric acid (10 percent).



- 2.4 Chemical-Resistant Epoxy Flooring shall be chemical-resistant floor surfacing system consisting of primer; topping including epoxy resin, hardener, coloring agent, and selected fine aggregates; and finish coat or coats. Topping, including aggregate, when tested in accordance with referenced standards, shall have a compressive strength of 9,500 psi (ASTM C 579), a flexural strength of 2,080 psi (ASTM C 580), an impact strength of 120 in. lbs (ASTM D 2794), a bond strength of 400 psi (ACI 503, Appendix A), and a water absorption rate of 0.04 percent (ASTM C 413). Tests of chemical resistance of cured floor surfacing system, when immersed for 7 days in reagents listed (Fed. Std. 406, Method 7011), shall show no effect from acetic acid (100 percent), chromic acid (10 percent), citric acid (20 percent), formaldehyde (37 percent), heavy-duty detergent, hydrochloric acid (37 percent), hydrogen peroxide (28 percent), lactic acid (85 percent), mineral spirits, nitric acid (40 percent), oleic acid, oxalic acid (10 percent), phosphoric acid (85 percent), potassium hydroxide (50 percent), sulfuric acid (75 percent), tannic acid (20 percent), tartaric acid (10 percent), and urine.
- 2.5 Epoxy Terrazzo Flooring shall be decorative floor surfacing consisting of primer, thermosetting epoxy resin matrix, decorative mineral aggregate, epoxy grout, and sealer. Heavy brass, 1/4-inch divider strips, and expansion joints shall also be provided as required. Materials shall conform to applicable National Terrazzo and Mosaic Association (NTMA) publications. Flooring, when tested in accordance with the standards, shall show no toxicity. Epoxy terrazzo flooring shall be self-extinguishing when tested in compliance with ASTM D 635.
- 3.0 EXECUTION:
- 3.1 Preparation:
- 3.1.1 Concrete Surfaces shall comply with ASTM C 811 unless otherwise indicated or required by manufacturer's instructions.
- 3.1.2 Wood Floors shall have contaminants removed by sanding, solvent cleaning, detergent cleaning, or other methods as required.
- 3.1.3 Primer Shall Be Applied over prepared substrate.
- 3.2 Installation:
- 3.2.1 Epoxy Quartz Chip Flooring, Epoxy Flooring and Chemical-Resistant Epoxy Flooring shall have a topping mix of aggregates and/or fillers trowel-applied to the following thickness':
- a. Epoxy quartz chip flooring: 1/4 inch.
  - b. Epoxy flooring: 3/16 inch.
  - c. Chemical-resistant epoxy flooring: 1/4 inch.
  - d. Epoxy Terrazzo Flooring: 1/4 inch.
- Finish or sealing coat or coats shall be applied after topping mix has cured. Floor system shall be applied to wall surfaces at locations indicated to form base with cover of radius and height designated. All interior and external corners of base shall be rounded.
- 3.2.2 Epoxy Terrazzo Flooring shall be applied according to NTMA recommendations and as follows. A 1/4-inch thick aggregate/filler topping mix and recommended curing compound shall be applied and the surface shall then be ground, rinsed, grouted, and reground. Finish or sealing coat or coats shall be applied after topping mix has cured. Floor system shall be applied to wall surfaces at locations



## 09000 - Finishes

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designated to form base with cove of radius and height indicated. All interior and external corners of base shall be rounded.

END OF SECTION 09720



## SECTION 09730

### BLUE STONE STAIR TREADS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of Bluestone Stair Treads. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Application procedures shall be in accordance with the product manufacturer's recommendation. Demolition and removal of materials shall be required to support the work.
- 1.1 Tests and Samples:
  - 1.1.1 Submit 8" x 10" samples for approval.
  - 1.1.2 No samples will be approved unless the Contractor furnishes data regarding locality, origin of stone, and test results from independent testing laboratory, indicating an abrasive (Ha) value between 16 and 20 minimum.
  - 1.1.3 Furnish additional treads as follows, in addition to those required by the drawings, furnish one additional thread. If there are more than 200 treads of one-tread size, furnish one additional tread for each additional 200 treads or portion thereof.
  - 1.1.4 From the total number of treads delivered, the Contracting Officer will select treads at random for sampling. The number of treads selected for sampling will be the same as the surplus treads furnished under Par. C. If the test result of a laboratory selected by the Contracting Officer gives an Abrasive Hardness value less than 16-20 minimum the entire shipment of treads shall be considered removed from the job.
- 1.2 Guarantee:

Any treat which shows any of the following defects within the one year guarantee period specified in the Contract shall be removed and replaced without cost to the Corpus Christi Army Depot.

  - 1.2.1 Discoloration due to imperfections within the stone.
  - 1.2.2 Evidence of scaling, or the visible existence of lamination or reads.
  - 1.2.3 Evidence of patched stone.
- 1.3 Installer Qualifications: Engage an installer who has successfully completed interior stonework similar in material design and extent to that indicated for this project, for the past 5 years.
- 2.0 PRODUCT:
  - 2.1 Materials:
    - 2.1.1 Bluestone shall be sound and entirely free from laminations or "reeds" and shall be of a dense, medium fine grain. It shall be free from iron or any other substance which will cause discoloration. Bluestone shall be dark in color and originate in New York State.



## 09000 - Finishes

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- 2.1.2 Treads and risers shall be 1-1/2" thick. They shall have a fine, sand-sawed finish. Top and bottom edges of the nosing shall be rounded up to 1/8" radius. Nosing shall project 3/4" beyond face of riser.
- 2.1.3 Treads and risers shall be in one piece, extending between strings without intermediate joints, except in the following locations:
  - 2.1.3.1 Where a center handrail is to be provided, the treads and risers shall have joint centered on the handrail.
  - 2.1.3.2 Where the lengths of treads or risers required by the drawings or specifications would exceed 8'0", joints shall be placed and directed.
- 2.1.4 Mortar for setting treads shall be Type M. Add latex admixture in proportion and concentration recommended by additive manufacturer. Mortar used for pointing shall contain mineral black color, as directed.
- 2.1.5 Provide pointing mortar mixed to match Architect's sample and complying with requirements indicated above for setting mortar.

Colored Mortar: Select and proportion pigments with other ingredients to produce color required. Do not exceed pigment-to-cement ratio of 1 to 10, by weight.
- 3.0 EXECUTION:
  - 3.1 Installation:
    - 3.1.1 Treads shall be evenly bedded, the mortar bed being continuous under the entire tread.
    - 3.1.2 Joints at ends of treads and joints between adjoining treads shall be 1/4". Back joints at risers shall be 1/8". Adjoining bluestone tread lengths shall be flush with each other and with finish surfaces of landings and platforms.
    - 3.1.3 All work shall be in accordance with detail drawings. No shop drawings are required.
    - 3.1.4 Damaged or spalled stones shall be removed. No patching will be permitted.
    - 3.1.5 Do all cutting of bluestone required (at sleeves for handrails, newels, etc.)
    - 3.1.6 Setting Stone, General:
      - A. Executive stonework by skilled mechanics, and employ skilled stone fitters at the site to do necessary field cutting as stones are set. Use power saws to cut stones; for exposed edges, produce edges which are cut straight and true.
      - B. Set stones to comply with requirements indicated on drawings and stair shop drawings. Install anchors and other attachments necessary to secure bluestone. Shim and adjust anchors and supports to set stones accurately in locations indicated with uniform joints of widths indicated and with edges and faces aligned.
      - C. Construction Tolerances: Set stone to comply with the following maximum tolerances:
        - 1. Variation from Plumb: 1/8" in 10' or more.
        - 2. Variation from Level: 1/8" in 20' or more.
        - 3. Variation from Location: 1/8" in 20' or more.





4. Variation in Surface Alignment: Plus or minus 1/32".
  5. Variation in Joint Width: Plus or minus 1/32".
  - D. Provide expansion joints, control joints and pressure relieving joints of widths and at locations indicated for joint sealers.
  - E. Wet stones to be set with mortar, which are dry at time of setting, by drenching or sponging them with water.
  - F. Set stones in a full bed of mortar with vertical joints slushed full.
- 3.2 Cleaning:
- 3.2.1 All mortar on exposed bluestone surfaces shall be washed off with a clean sponge and water before mortar hardens.
  - 3.2.2 The removal of protection work and cleaning shall be delayed until the final cleaning is directed by the Contracting Officer.
  - 3.2.3 The final cleaning, bluestone shall be swept clean, then thoroughly and vigorously scrubbed with a stiff fibre brush and clear water (no acid or other damaging substance shall be used.)
- END OF SECTION 09730



## SECTION 09731

### CONDUCTIVE ELASTOMERIC LIQUID FLOORING

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of conductive elastomeric liquid flooring. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.1 Quality Assurance: Installer is to be a firm who has a minimum of two years experience with the installation of conductive elastomeric liquid flooring and successfully completed installations of a similar size and scope as specified in this section.
- 2.0 PRODUCTS :
- 2.1 Carbon Black shall comply with ASTM D 561.
- 2.2 Acrylic/Urethane shall be water dispersed acrylic resin mixed with dry components and aggregates. Material shall comply with Mil. Spec. MIL-D-3134. Factory pre-mixed with carbon black.
- 2.3 Acrylic shall be modified high strength acrylic resin mixed with dry component powders with tensile strength of 4,890 psi, bond strength of 290 psi, and flexural strength of 1,650 psi, minimums, complying with Mil. Spec. MIL-D-3134.
- 2.4 Neoprene Rubber shall be water-phase neoprene rubber composition complying with NTMA Specifications, with tensile strength of .245 psi, bond strength to concrete of 255 psi, and compressive strength of 2,600 psi, minimums.
- 2.5 Latex shall be specially formulated, emulsion resin mixed with dehydrated powders. Comply with Paragraphs 3.4 through 3.22 of Mil. Spec. MIL-D-3134, except Paragraph 3.7 shall not apply.
- 2.6 Epoxy Emulsion shall be 100 percent non-volatile, thermosetting, two-part epoxy resin matrix with tensile strength of 4,000 psi, bond strength of 200 psi, and compressive strength of 14,000 psi.
- 2.6.1 Water-Emulsified Epoxy Resin shall have the following characteristics:
- |                                       |                          |
|---------------------------------------|--------------------------|
| Viscosity:                            | 180 centipoises at 25 C. |
| Specific weight:                      | 9.2 pounds per gallon.   |
| Color:                                | opaque white.            |
| Solids (minimum):                     | 59 percent.              |
| Stable after five freeze-thaw cycles. |                          |
- 2.6.2 Water Emulsified Hardener shall have the following characteristics:
- |                                       |                              |
|---------------------------------------|------------------------------|
| Viscosity:                            | 160-190 centipoises at 50 C. |
| Specific weight:                      | 8.6 pounds per gallon.       |
| Solids (minimum):                     | 75.0 percent.                |
| Stable after five freeze-thaw cycles. |                              |
- 2.7 Polyacrylate: A polyacrylate hydraulic cement copolymer and dry coreactant composite shall comply with requirements of Mil. Spec. MIL-D-3134.



## 09000 - Finishes

- 2.8 Polyester: Thermosetting polyester topping resin, catalyst, and premixed fillers shall all comply with Mil. Spec. A-52767, with tensile strength of 5,000 psi, compressive strength of 14,000 psi, and bond strength of 200 psi, minimum.
- 2.9 Fillers: Inert mineral or cellulosic material best suited for the resin binders shall be used. Filler in quantity necessary to impart required physical characteristics shall be furnished with particle size not greater than 3/16 inch in any dimension and shall contain sufficient fines to provide an even-textured, non-slip type of surface on the finished topping.
- 2.10 Primer shall be material that will penetrate into pores of substrate. Primer shall bond with topping to form a permanent monolithic bond between the substrate and the topping.
- 3.0 EXECUTION:
- 3.1 Environmental Conditions: Elastomeric liquid flooring installation shall not be started unless ambient temperature of area in which the work occurs is at least 50° F. and rising, and is maintained above 50° F. without interruption while the work is being done and for at least three days after the completion of the work.
- 3.2 Installation Over Wood Floors: Renail wood subfloors where loose, using annular or ring type zinc-coated nails. Remove and replace rotted, broken, or otherwise unsatisfactory wood subflooring and all other defective materials.
- 3.3 Installation Over Concrete Floors: Roughen surfaces that are glossy, painted, or have loose surface material. Fill large cracks and holes.
- 3.4 Cleaning: Thoroughly clean all surfaces to receive flooring to remove all grease, oil, wax, dirt, dust, and other foreign matter.
- 3.5 Topping: Install topping 1/8 inch thick for epoxy type and 1/8 to 3/8 inch thick for other types.
- 3.6 Bases shall be cover type cast-in-place with 1-inch radius cove and shall be 6 inches high.
- 3.7 Finish or Sealer Coat shall be applied.
- 3.8 Testing: After completion of installation, test conductive floors. Test must prove that conductive floors comply with all requirements of ANSI/UL 779.

END OF SECTION 09731



## SECTION 09740

### HEAVY-DUTY CONCRETE FLOOR TOPPING

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of heavy-duty concrete floor topping. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Portland Cement: Comply with ASTM C 150, Type I or Type III.
- 2.2 Aggregate: Selected, clean, hard, and tough material, either crushed or natural, as approved by the Contracting Officer. Trap rock, granite, quartz, corundum, or manufactured products such as silicon carbide or heat-treated aluminum oxides are acceptable. They shall comply, in all respects except gradation, with ASTM C 33.
- 2.3 Water shall be clean, fresh, potable water approved by public health authorities for domestic consumption.
- 3.0 EXECUTION:
- 3.1 Preparation: Roughen surfaces of present concrete that are glossy, painted, or have loose surface material. Clean and sweep thoroughly to remove all grease, oil, wax, dirt, sand, dust, and all other foreign matter.
- 3.2 Installation: Nominal mixture shall be one part of Portland cement, one part of fine aggregate, and two parts of coarse aggregate by volume. Not more than four gallons of mixing water shall be used for each bag of Portland cement in the mixture. Mixing of concrete shall continue for at least one minute after all ingredients are in mixer. Curing shall be done by spray application.

END OF SECTION 09740



## SECTION 09741

### ARMORED FLOORING

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of armored flooring. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.1 Manufacturer SILIKAL or approved equal.
- 2.0 PRODUCTS :
  - 2.1 Premixed Topping: Specially factory formulated topping mix of Portland cement, ASTM C 150 Type I or III, iron aggregate and plasticizer designed to produce 28 day compressive strength of over 8,000 psi.
  - 2.2 Water: Water shall be clean, fresh, potable water approved by public health authorities for domestic consumption.
- 3.0 EXECUTION:
  - 3.1 Preparation: Roughen surfaces of present concrete floor that are glossy, painted, or have loose surface material. Clean and sweep thoroughly to remove all grease, oil, wax, dirt, sand, dust, and all other foreign matter.
  - 3.2 Installation: Mix premixed topping and water in a paddle type mixer for three minutes. Place topping over prepared concrete slab to a thickness of 3/4 to one inch. Float and machine trowel as recommended by manufacturer. A shake of premixed topping shall be added. Hand trowel to a smooth hard finish. Cure by applying curing membrane complying with ASTM C 309.

END OF SECTION 09741



## SECTION 09750

### BRICK FLOORING

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of brick flooring. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.1 Manufacturer: HANLEY BRICK, HANOVER PREST-PAVING or approved equal.
- 2.0 PRODUCTS:
  - 2.1 Brick Materials:
    - 2.1.1 Light Traffic Paving Brick: ASTM C 902, Class SX, MX, or NX, Type I, II, or III, Application PS, PX, or PA. Thickness shall be nominal 1 1/2 inch.
    - 2.1.2 Chemical-Resistant Brick: Solid brick, ASTM C 279, Type H or L.
    - 2.1.3 Industrial Floor Brick: Solid brick, ASTM C 410, Type T, H, M, or L.
    - 2.1.4 Base: Matching base shall be provided at walls and vertical elements, including stretcher units, internal and external corners, stops, and other locations as required. Type shall be square-top cove, round-top cove, or turn-up base.
    - 2.1.5 Lining Units shall be brick units matching floor brick for lining pits and trenches and for curbs and pads occurring in floor brick field. Provide special trim shapes for continuous coverage of substrates.
    - 2.1.6 Temporary Coating: Wax shall be compatible with cleaning method required to remove wax without damage to grout or brick.
  - 2.2 Setting Materials:
    - 2.2.1 Mortarless Applications:
      - 2.2.1.1 Roofing Felt: ASTM D 226, 15-pound asphalt-saturated felt.
      - 2.2.1.2 Fine Aggregate for Setting Bed: ASTM C 144 or stone screenings.
      - 2.2.1.3 Sand for Joints: ASTM C 144, free of clay particles.
    - 2.2.2 Portland Cement Applications:
      - 2.2.2.1 Portland Cement: ASTM C 150, Type I, natural color or skite, to produce the required color of mortar or grout.
      - 2.2.2.2 Aggregate: ASTM C 154 or C 404, or both.
      - 2.2.2.3 Liquid Admixture for Setting Bed and Grout: Liquid latex mortar additive with a compressive strength of 3,000 psi, bond strength of 500 psi, no loss in strength when exposed to ozone for 200 hours at an ozone concentration of 200 ppm and water absorption of 4 percent maximum.



- 2.2.2.4 Bond Coat Admixture: High strength liquid latex mortar additive with a compressive strength of 5,000 psi, bond strength of 500 psi, tensile strength of 500 psi, no loss in strength when exposed to ozone for 200 hours at 200 ppm, and water absorption of 4 percent maximum.
- 2.2.2.5 Pigments: Commercial iron oxide, manganese dioxide, ultramarine blue, chromium oxide, or carbon black, suitably compounded for use in mortar mixes.
- 2.2.2.6 Water: Clean and free of deleterious materials which would impair strength or bond.
- 2.2.3 Chemical-Resistant Mortar and Grout:
  - 2.2.3.1 Sulfur Mortar: ASTM C 287, with silica or carbon filler.
  - 2.2.3.2 Resin Mortar: Liquid resin and filler material shall comply with ASTM C 395. Resin shall be phenolic, furan, polyester, epoxy, or vinyl ester. Filler shall be silica or carbon.
  - 2.2.3.3 Resin Grout: ASTM C 658, epoxy or furan.
  - 2.2.3.4 Chemical-Resistant Membrane: Multiple-component asphaltic system consisting of asphalt primer and bituminous-coated glass fiber cloth embedded in hot-melt asphalt compound.
  - 2.2.3.5 Expansion Joint Filler: Elastomeric sealant of type recommended and produced by mortar/grout manufacturer for type of application indicated. Include primer and backer rod where required.
- 2.2.4 Miscellaneous Materials:
  - 2.2.4.1 Cleavage Membrane: 15-pound asphaltic felt, ASTM D 226, Type I, or 4-mil polyethylene sheeting, ASTM C 171.
  - 2.2.4.2 Setting Bed Reinforcement: 2 inches by 2 inches, 16/16, welded wire fabric.
  - 2.2.4.3 Sealer: Phenolic type or acrylic base non-slip material,
- 3.0 EXECUTION:
  - 3.1 Expansion and control joints: provide sealant-filled joints at locations and widths required. Install expansion joint filler where sealant type joints are required in chemical-resistant flooring.
  - 3.2 UngROUTED Mortarless Brick Flooring:
    - 3.2.1 Cushioning Material: Install roofing felt, two layers with edges butted to achieve uniform thickness, and fine aggregate setting bed screeded to depth required.
    - 3.2.2 Lay Bricks and fill joints with sand. After all bricks are in place and all joints are filled, remove excess sand.
  - 3.3 Latex-Modified Portland Cement Applications:
    - 3.3.1 Apply Cement Slush Coat not to exceed 1/16 inch thickness.
    - 3.3.2 Mix Portland Cement, Sand, and Liquid Admixture.
    - 3.3.3 Spread and Screed Setting Bed to uniform thickness at subgrade elevations required.
    - 3.3.4 Place Brick before initial set of cement occurs. Tamp and beat bricks to obtain full contact with setting bed.



## 09000 - Finishes

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- 3.3.5 Grout Joints as soon as possible after initial set of setting bed and cure grout.
- 3.4 Chemical-Resistant Sulfur Mortar Applications shall comply with ASTM C 306 unless otherwise directed.
- 3.5 Chemical-Resistant Resin Mortar Applications:
  - 3.5.1 Bricklaying: Except as otherwise directed, bricklaying shall comply with ASTM C 399.
  - 3.5.2 Tile Setting: Except as otherwise directed, tile setting shall comply with ANSI/ASTM C 723.
  - 3.5.3 Chemical-Resistant Membrane: Provide chemical-resistant asphaltic membrane system over concrete substrates under chemical- resistant mortar applications where directed.
  - 3.5.4 Set Bricks on Vertical Surfaces in compliance with ASTM C 399, using either resin mortar or sulfur as bed joint material, as required.
- 3.6 Chemical-Resistant Cement Mortar and Resin Grout Applications:
  - 3.6.1 Application of brick in hydraulic cement mortar setting bed shall comply with ASTM C 398. Grouting joints with resin grout shall comply with ASTM C 723, unless otherwise directed.
  - 3.6.2 Install Cleavage Membrane as required.
  - 3.6.3 Reinforce Setting Bed with welded wire fabric as required.

END OF SECTION 09750





## SECTION 09751

### LIGHT-DUTY BRICK FLOORING

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of light-duty brick flooring. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.1 Manufacturer: Hanley Brick, Hanover Prest-Paving or approved equal.
- 2.0 PRODUCTS:
  - 2.1 Floor Brick (Brick Pavers): ASTM C 62, Grade SW, solid uncured brick, 1-1/4 inches thick by 3-1/4 inches by 8 inches.
  - 2.2 Paving Brick: ASTM C 902, solid uncured brick of size selected by the Contracting Officer.
  - 2.3 Masonry Mortar: ASTM C 270, Type M.
  - 2.4 Portland Cement: ASTM C 150, Type I.
  - 2.5 Aggregate for Masonry Mortar: ASTM C 144.
  - 2.6 Hydrated Lime: ASTM C 207, Type S.
  - 2.7 Aggregate for Cement Setting Beds: Sand as recommended in ASTM C 404.
  - 2.8 Aggregate for Grout: Sand as recommended in ASTM C 404.
  - 2.9 Pigments: Inert mineral oxides or carbon black.
  - 2.10 Sand Setting Bed: ASTM C 33.
  - 2.11 Commercial Cement Grout: Proprietary compound of Portland cement and additives.
  - 2.12 Cleavage Membrane: 15-pound asphalt felt or 4-mil polyethylene sheeting.
  - 2.13 Setting Bed Reinforcement: 2-inch by 2-inch, 16/16, welded wire, fabric, ASTM A 185.
- 3.0 EXECUTION:
  - 3.1 General Requirements: Do not use brick with chips, cracks, voids, discolorations, and other defects. Cut brick shall have clean, sharp, unchipped edges. Use full units without cutting wherever possible. Set brick with uniform joints.
  - 3.2 UngROUTED Applications: Place sand setting bed and compact by tamping. Set brick closely together, and sweep fine sand over surface to fill joint irregularities.
  - 3.3 Portland Cement Applications:
    - 3.3.1 Preparation of Subbase: Clean subbase to remove dirt, dust, debris, and loose particles,



## 09000 - Finishes

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- 3.3.2 Install Cleavage Membrane and provide folded membrane material at overlapping edges to form lock joints.
- 3.3.3 Apply Slush Coat of cement grout over surface of concrete subbase about 15 minutes prior to placing setting bed.
- 3.3.4 Setting Bed: Mix one bag of Portland cement to 3 cu. ft. of sand. Use only enough water to produce a moist surface when setting bed is ready for setting of brick. Install reinforcing mesh if over a wood substrate.
- 3.3.5 Wet Brick several hours before laying. Do not lay bricks with free water on the surface.
- 3.3.6 Set Brick before initial set of cement bed occurs. Do not set brick on dry bed. Set and level each brick immediately.
- 3.3.7 Grout Joints as soon as possible after initial set of setting bed. Force grout into joints, strike flush, and tool slightly concave.
- 3.3.8 Use Portland Cement Grout mixed in the proportion of one bag of Portland cement to 2 cu. ft. of sand mixed with water to the consistency of heavy cream.
- 3.4 Masonry Mortar Applications:
- 3.4.1 Mix Mortar to comply with ASTM C 270 Proportion Specifications for Type "M" mortar.
- 3.4.2 Install Brick in bed joints of mortar with vertical joints filled with mortar. Remove excess mortar promptly as the work progresses.
- 3.4.3 Strike Joint flush with top surface of brick and tool slightly concave.
- 3.5 Pointing: During the tooling of joints, enlarge voids or holes and completely fill with mortar or grout.
- 3.6 Cleaning: Remove excess mortar/grout from exposed brick surfaces, wash, and scrub clean. Rinse with clean water.
- 3.7 Sealing and Waxing: After cleaning, apply a neutral sealer to brick flooring, and when dry, apply a suitable floor wax recommended for brick floors.

END OF SECTION 09751



## SECTION 09770

### STANDARD FLOOR TREATMENT

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for standard floor treatments for terrazzo, ceramic tile, oxychloride, concrete, and resilient flooring. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
  - 2.1 Cleaning Compound: A liquid chemical cleaner containing non-ionic and anionic type detergents, non-reactive to flooring. Compound shall have no free metal alkalis, no artificial coloring, and no fatty acids. Compound shall be UL listed as "slip-resistant."
  - 2.2 Stripper: An ammoniated stripper that will penetrate and loosen wax films without damaging flooring. Stripper shall be non-flammable and phosphate-free with a flash point of none to boiling.
  - 2.3 Wax: Water-emulsion type, self polishing, made from 100 percent No. 1 prime Carnauba wax, UL listed as "slip-resistant."
  - 2.4 Polish: Metal cross-linked copolymer, slip-resistant polish. Polish shall dry to clear gloss without buffing.
  - 2.5 Sealer: Penetrating type seal that will fill pores and leave a clear, hard, non-flaking, non-tracking finish. Sealer shall be UL listed as to slip resistance.
- 3.0 EXECUTION
  - 3.1 Preparation and Installation:
    - 3.1.1 Terrazzo and Oxychloride Floors:
      - 3.1.1.1 Clean floors with a neutral liquid cleaner with pH factor as near seven as possible.
      - 3.1.1.2 Apply two coats of sealer, and buff with electric polishing machine. .
    - 3.1.2 Ceramic Tile Floors: Scrub thoroughly using a neutral liquid cleaner, and apply one coat of penetrating sealer.
    - 3.1.3 Concrete Flooring:
      - 3.1.3.1 Scrub thoroughly using a neutral liquid cleaner. Apply stripper to remove stubborn grease, waxes, and polishes.
      - 3.1.3.2 When floor is clean and dry, apply two coats of penetrating sealer.
    - 3.1.4 Resilient Flooring:



## 09000 - Finishes

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3.1.4.1 Scrub with a light solution of neutral chemical cleaner. Use a stripper to remove build-up of old wax and polishes. Rinse clean, and allow to dry.

3.1.4.2 Apply two coats of wax and machine polish.

END OF SECTION 09770



## SECTION 09771

### FLOOR TREATMENT NON-SLIP COATINGS ON CONCRETE FLOORS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for non-slip coatings on concrete floors. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS : A combination of pigmented two-part high solids urethane resin and a select gradation of sand shall be used. Color shall be selected from manufacturer's standard colors.
- 2.1 Tensile Strength and Elongation: Tensile strength shall be 580 psi, and elongation shall be 57 percent, all complying with ASTM D 412.
- 2.2 Water Absorption: Coatings shall not absorb water, in accordance with ASTM D 570.
- 2.3 Coefficient of Friction shall comply with ASTM D 1894.
- 2.4 Abrasion Resistance shall be ASTM D 1044 Taber Abraser, H-18 wheel, 1 kg load. Weight loss shall be 0.20 grams after 1,000 cycles.
- 2.5 Impact shall be by a 2-pound falling ball at 150 inch-pounds pressure, 0.05 inch maximum indentation with no cracking.
- 2.6 Chemical Resistance shall be non-staining to most common chemicals, such as 10 percent acetic acid, 10 percent citric acid, 10 percent sodium hydroxide, and ethyl alcohol.
- 3.0 EXECUTION: Concrete Floors shall be either acid etched or sand blasted. Surface to be coated shall be clean, dry, and free from surface contaminants. Thickness of floor treatment shall be 1/2".

END OF SECTION 09771



## SECTION 09772

### FLOOR TREATMENT - REFINISHING WOOD FLOORS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for refinishing wood floors. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
  - 2.1 Cleaning Compound: A liquid chemical cleaner containing non-ionic and anionic type detergents, non-reactive to wood flooring. Compound shall have no free metal alkalis; no artificial coloring and no fatty acids. Compound shall be UL listed as "slip-resistant."
  - 2.2 Varnish Remover: Non-flammable paint and varnish remover.
  - 2.3 Stain: Penetrating type non-fading wood stain.
  - 2.4 Wood Filler: Paste type wood filler, pigmented if necessary to match sample, complying with Fed. Spec. TT-F-336.
  - 2.5 Floor Sealer: Penetrating type, pliable, wood-hardening finish/sealer.
  - 2.6 Floor Varnish: Alkyd resin varnish, specially compounded for floor finish, Fed. Spec. TT-V-IO9.
  - 2.7 Urethane Finish: Specially compounded for wood floor finish, moisture curing type, for multiple-coat application.
  - 2.8 Floor Wax: Liquid, solvent-type, slip-resistant, Fed. Spec. P-W-I58, Type I, Class 2.
- 3.0 EXECUTION:
  - 3.1 Preparation:
    - 3.1.1 Cleaning: Scrub thoroughly with cleaning compound and warm water. Rinse with clean water, mop dry, and buff with polishing machine.
    - 3.1.2 Varnish Removal: Apply paint and varnish remover in adequate amount to insure removal of all coats.
    - 3.1.3 Sanding: Traverse floors two times with an electric-powered sanding machine. A rotary disc sander may be used for the final cut, but first cut shall be made with a drum-type machine. The first cut may be made crosswise of the grain or at a 45-degree angle. Make second cut in direction of grain. Use No. 1/2 sandpaper for first traverse and No. 0 for second traverse. Use an electric edger or hand sander for sanding areas near walls, in corners, and small closets.
  - 3.2 Installation:
    - 3.2.1 Apply Wood Paste Filler, followed by wiping cross-grain to work into pores and cracks.
    - 3.2.2 Apply Stain if needed to match selected finish.



## 09000 - Finishes

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- 3.2.3 Apply Sealer (2 coats) complying with Fed. Spec. TT-S-I76. Use Class I for white oak and red oak floors and Class II for beech, birch, and hard maple floors.
- 3.2.4 Apply Floor Varnish, (3 coats) buffing after each coat. First coat may be thinned as a sealer.
- 3.2.5 Apply Urethane Finish. Apply as many coats as needed to build a dry film thickness of 1.0 mil.
- 3.2.6 When Floors are Dry, apply two coats of wax complying with Fed. Spec. P-W-I55; concentration 12 percent. Spread the wax at the rate of 1,500 square feet per gallon and polish the floors with a weighted floor brush or an electric polisher.
- 3.2.7 Protection: Upon completion of work, cover all traffic areas immediately with nonstaining kraft paper or polyethylene, taped along edges, and maintain floor protection until acceptance.

END OF SECTION 09772



## SECTION 09775

### SOAPSTONE

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of soapstone. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support work.
- 1.1 Related Sections:
- A. Sanitary trim, drain and piping at sink      Section 15401
  - B. Cabinetry      Section 06401
  - C. Structural Concrete Slabs      Section 03300
- 1.2 References:
- A. American Society of Testing and Materials (ASTM), latest edition.
    - 1. C207 Specification for Mortar for Unit Masonry.
    - 2. A-19 Brass anchors.
- 1.3 Submittals:
- A. General: Refer to General Conditions and General Requirements for procedures to be followed.
  - B. Product Data: Submit manufacturer's technical data for each type of stone, stonework accessory and other manufactured product required.
  - C. Shop Drawings: Submit cutting and setting drawings indicating sizes, dimensions, sections and profiles of soapstone, joints, supports, anchors and other details showing relationship with other work.
  - D. Samples: Submit 8" x 10" samples of soapstone for approval prior to delivery.
- 1.4 Quality Assurance:
- A. Installer Qualifications: Engage an Installer who has successfully completed interior stonework similar in material design and extent to that indicated for this project, for the past 5 years.
  - B. Regulatory Requirements:
    - 1. Uniform Building Code
  - C. Single Source Requirements:
    - 1. Stone: Obtain all soapstone from a single source with resources to provide materials of consistent quality and the capacity to cut and finish material with cut delaying the work.





2. Setting Materials: Obtain mortar ingredients of uniform quality and from one manufacturer for each cementitious and admixture component and from one source or produce for each aggregate.

1.5 Delivery, Storage, and Handling:

- A. Deliver materials to project in an undamaged condition.
- B. Store and handle stone and related materials to prevent deterioration or damage due to moisture, temperature changes, contaminants, corrosion, breakage, chipping and other causes.
  1. Do not use pinch or wrecking bars.
  2. Lift with wide - belt slings where possible; do not use wire rope or ropes containing substances which might cause staining. Move stone with wood rollers, with cushions at end of wood slides.
  3. Store stones on wood skids, covered with non-staining, waterproof membrane. Place and stack skids and stones to distribute weight evenly and to prevent breakage or cracking of stones.
  4. Protect stone with non-staining, waterproof membrane, but allow air to circulate around stones.
  5. Store cementitious materials off the ground, under cover and in a dry location.

1.6 Project Conditions: Do not set stone when air temperature or temperature of materials is below 50°F.

1.7 Guarantee: Any piece of soapstone installed which shows any of the following defects within the one year guarantee period specified in the contract shall be removed and replaced without cost to the Contracting Officer.

- A. Discoloration due to imperfections within the stone.
- B. Evidence of scaling or the visible existence of laminations or "reeds".
- C. Evidence of patched stone.

2.0 PRODUCTS:

2.1 Materials, General:

- A. Comply with referenced standards and other requirements indicated applicable to each type of material required.
- B. Provide matched blocks from a single quarry for each type, variety, color and quality of stone required. Provide blocks from a single bed of quarry stratum, unless stones from randomly selected blocks are acceptable to the Contracting Officer.

2.2 Soapstone:

- A. Provide soapstone of best quality, close grained acid and moisture proof, suitable for chemical storage.
- B. Assemble stonework with dado rabbet joints made tight with brass bolts. Point joints with cement made of litharge and glycerine colored to match the soapstone, with joints rubbed to a



## 09000 - Finishes

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smooth even finish. Epoxy cement equal in quality to "smoothon" may be substituted for litharge and glycerine.

C. Setting Materials:

1. Between stonework and walls: plaster of paris.
2. Between stonework and floors: cement mortar.

D. Secure stone set against walls with brass expansion bolts or toggle bolts, with bolt heads counter sunk into stone slabs and concealed.

E. Furnish all necessary dowels, bolts, anchors, splines, etc., required to set and secure stonework in place in a rigid manner.

F. Soapstone sinks are to be provided in all locations where soapstone counter tops and sinks are called for. Sanitary trim, drain, and piping will be furnished and installed by others as specified in Division 15 - Plumbing and Drainage.

G. Soapstone finish to be honed, with bullnose edges unless otherwise specified.

### 2.3 Mortar Materials for Setting Soapstone Floors and Pointing:

1. Portland Cement: ASTM C150, Type 1. Provide gray or white cement as needed to produce mortar color required.
2. Hydrated Lime; ASTM C207, Type S.
3. Aggregate; ASTM C144 and as indicated below:
  1. For joints narrower than 1/4" use aggregate graded with 100 percent passing the No. 8 sieve and 95 percent of the No. 16 sieve.
  2. For pointing mortar, use aggregate graded with 100 percent passing the No. 16 sieve.
  3. White Aggregates; Natural white sand or ground white stone.
  4. Water: Clean, non-alkaline, Drinking Water.
  5. Latex Additive: Manufacturer's standard formulation containing acrylic latex, designated by manufacturer for use with thick-bed mortar, bond coat and grout applications.

### 2.4 Soapstone Anchors:

- A. General: Provide anchors and attachments of type and size required to support stonework and fabricated from the following metals: Brass.
- B. For all methods of anchorage; bolts and other fasteners in direct contact with soapstone provide the following: Brass in compliance with ASTM B19.

### 2.5 Stone Accessories:

- A. Setting Buttons: Lead or resilient plastic buttons, non staining to stone, sized to suit pint thickness' and bed depths of stonework.
- B. Cleaner: Provide stone cleaner suitable for soapstone, as recommended by stone producer. Do not use acid-type cleaning agents or other cleaning compounds containing caustic or harsh fillers, except where expressly approved by stone producer.



- C. Sealer for Soapstone Floors: Colorless, slip and stain resistant sealer which will not affect color or physical properties of stone, as recommended by sealer manufacturer and by stone producer for application indicated.

2.6 Mortar Mixes:

- A. General: Do not add admixtures including air-entraining agents, accelerators, retarders, water repellent agents, anti-freeze compounds or calcium chloride, unless otherwise indicated.
- B. Mixing: Combine and thoroughly mix cementitious material, water and aggregates in a mechanical batch mixer; comply with referenced ASTM standard for mixing time and water cement.
- C. Setting Mortar: Comply with ASTM C270, Proportion Specification for types of mortars and applications required below.
  - 1. Set soapstone with Type M mortar.
  - 2. Add latex admixture in proportion and concentration recommended by additive manufacturer.
- D. Pointing Mortar: Provide pointing mortar mixed to match the Contracting Officer's sample and complying with requirements indicated above for setting mortar.
  - 1. Colored Mortar: Select and proportion pigments with other ingredients to produce color required. Do not exceed pigment to cement ratio of 1 to 10, by weight.
  - 2. Add latex additive in proportion and concentration recommended by additive manufacturer.

2.7 Fabrication:

- A. General: Fabricate soapstone in sizes and shapes required to comply with requirements indicated including details on drawings and actual field conditions.
- B. Cut and drill sinkages and holes in stones for anchors, fasteners and supports, as indicated or needed to set stonework securely in place.
- C. Cut stones to produce pieces of thickness, size and shape indicated or required and within fabrication, tolerances recommended by applicable stone association for faces, edges, beds and backs.
  - 1. Dress joints straight and flush with stone face, unless otherwise indicated.
  - 2. Clean stones to remove stains and free particles.
- D. Finish exposed faces and edges of stones to comply with requirements indicated, and to match approved samples.
- E. Carefully inspect finished stones for compliance with requirements for appearance, material and fabrication replace defective stones with ones that do comply. Grade and mark stones for overall uniform appearance when assembled. Natural variations in appearance are acceptable if installed stones match range of color and other appearance characteristics of approved samples.

3.0 EXECUTION:



## 09000 - Finishes

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### 3.1 Examinations:

- A. General: Prior to the installation of the work of this section, carefully examine all surfaces to receive soapstone and report all defects affecting installation to the Contracting Officer. Start of work constitutes that all conditions are satisfactory.
- B. Field Measurements: Contractor is responsible for taking accurate field measurements at the building and fitting stonework in the available space. See structural drawings for required floor depression.

### 3.2 Preparation:

- A. Advise installers of other work about specific requirements for placement of inserts and similar items for anchoring and setting soapstone. Furnish installers with drawings showing locations of these items, where required.
- B. Clean stone prior to setting to remove soil, stains, and foreign materials. Thoroughly scrub stones with fiber brushes followed by a thorough drenching with clear water. Use only mild cleaning compounds that contain no caustic or harsh filler or abrasives.

### 3.3 Setting Stone, General:

- A. Execute stonework by skilled mechanics, and employ skilled stone fitters at the site to do necessary field cutting as stones are set. Use power saws to cut stones; for exposed edges, produce edges which are dull straight and true.
- B. Set stones to comply with requirements indicated on drawings. Install anchors and other attachments necessary to secure soapstone. Shim and adjust anchors and supports to set stones accurately in locations indicated with uniform joints of widths indicated and with edges and faces aligned.
- C. Construction Tolerances: Set stones to comply with the following maximum tolerances:
  - 1. Variation from Plumb: 1/8" in 10' or more.
  - 2. Variation from Level: 1/8" in 20' or more.
  - 3. Variation from Location: 1/8" in 20' or more.
  - 4. Variation from Surface Alignment: Plus or minus 1/32".
  - 5. Variation from Joint Width: Plus or minus 1/32".
- D. Provide expansion joints, control joints and pressure relieving joints of widths and at locations indicated, for joint sealers.
- E. Wet stones to be set with mortar which are dry at time of setting, by drenching or sponging them with water.
- F. Set stones in a full bed of mortar with vertical joints slushed full.
- G. Place setting buttons of proper size and quantity to maintain uniform joint widths. Hold buttons at least one joint width back from face of stones and conceal with mortar.

### 3.4 Installation of Interior Trim:



- A. Erect interior trim plumb and true with joints uniform in width and accurately aligned. Provide setting buttons as required to maintain joint width.
  - 1. Set wainscot units firmly against plaster spots located at or near the anchors and spaced not further than 18" apart over the back of the piece.
  - 2. At locations where stone may be exposed to moisture, use portland cement mortar in lieu of plaster for setting spots.
  - 3. Tie-Backs: Provide at least 2 anchors per stone up to 2 sq. ft. in face area, at least 4 per stone up to 20 sq. ft. ; and at least 2 additional anchors for every 10 additional sq. ft.
- B. Point joints after setting with pointing mortar of color indicated. Rub joints flush and smooth with plastic tool.

3.5 Installation of Soapstone:

- A. Set stone true and plumb. Complete soapstone installation before the adjacent finished floors are laid. Remove all scratches and other defacements. Leave all surfaces clean and in perfect condition.
- B. All cutting and drilling required for fastening supports, pipes and penetrations will be done under this section.
- C. Follow drawings for sizes and arrangements of acid room door saddle, floor, wainscoting, carboy shelf, wall shelves and partitions.
- D. Remove damaged or spalled stones. No patching will be permitted.

3.6 Pointing:

- A. Clean stone joints and apply pointing mortar in 3/8" layers maximum until a uniform depth is formed; compact each layer thoroughly and allow to become thumbprint hard before applying next layer.
- B. Tool joints when pointing mortar is thumbprint hard.

3.7 Adjusting:

- A. Remove and replace any soapstone of the following description:
  - 1. Broken, chipped, stained or otherwise damaged stones.
  - 2. Defective joints.
  - 3. Stones and joints not matching approved samples.
  - 4. Stonework not complying with other specified requirements.
- B. Replace in manner which results in stonework matching approved samples, complying with other requirements and showing no evidence of replacement.

3.8 Cleaning:

- A. All mortar shall be washed off with a clean sponge and water before mortar hardens on soapstone surface.



## 09000 - Finishes

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- B. Delay removal of protection work and cleaning until final cleaning is directed by the Contracting Officer.
- C. Clean interior stonework after setting, pointing, and curing is complete; use procedures recommended by stone manufacturer.
- D. Sealing: Apply sealer to cleaned interior soapstone flooring in compliance with sealer manufacturer's instructions.

### 3.9 Protection:

- A. Protect interior stone surfaces during the construction period with draft paper or other heavy covering of type that will not stain or discolor stone.
- B. Before inspection for substantial completion, remove protective covering and clean surfaces as recommended by sealer manufacture.

END OF SECTION 09775



## SECTION 09800

### SPECIAL WALL COATING

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and application of special wall coating. Products shall match existing materials as directed by the Contracting Officer. Application procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.1 Manufacturer:
- A. "Glid-Tile" by Glidden-Durkee Division of SCM Corp., Cleveland, Ohio.
  - B. "Pitt-Glaze" by PPG Industries, Inc., Pittsburgh, Penn.
  - C. "Sanitile 550CB" by Master Mechanic Co., Cleveland, Ohio
  - D. or approved equal.
- 1.2 Testing:
- A. System shall be tested by an independent testing laboratory on concrete block substrate for fire resistance in accordance with ASTM tunnel test E-84-70.
  - B. Coating system shall meet the requirements of class A interior finish, having a rating not exceeding 25 for Flame Spread, Fuel contributed and Smoke Density.
- 1.3 Submittals:
- A. Test Reports:
    - 1. Submit copies of fire rating reports of coating application to concrete block substrate.
    - 2. Submit certified test reports of acceptable testing agencies which perform testing in accordance with ASTM E-84
  - B. Samples:
    - 1. Submit sample for approval of coating application to concrete block substrate.
    - 2. Coating shall be applied in a stepback procedure so as to leave exposed a portion of the concrete block and subsequent portions of each coat.
    - 3. Submit color chips which demonstrate the complete range of manufacturer's standard colors.
- 1.4 Product Delivery, Storage and Handling:
- A. Deliver materials in original sealed containers with unbroken seals bearing name of manufacturer and product identification.
  - B. Reject containers which do not bear all above requirements.



## 09000 - Finishes

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- C. Reject damaged containers found unsuitable for use and remove from job site.
- D. Store materials in assigned spaces as directed.
- E. Provide Project Superintendent with one key for each assigned space if spaces are to be kept locked when not in use.

### 1.5 Environmental Conditions:

- A. Temperature: Do not apply coating when temperature of substrate material is below 50°F and surrounding temperature is below 50°F.
- B. Protection:
  - 1. Protect floors with drop cloths or building paper.
  - 2. Remove oily rags, waste, empty containers from site each night.
  - 3. Keep containers tightly closed.
  - 4. Post caution signs warning against smoking and open flame when working with flammable materials.
- C. Ventilation:

Provide ventilation in area to receive coating introducing fresh air and exhausting air continuously during and 24 hours after application to maintain non-toxic unpolluted, safe working area.

### 2.0 PRODUCTS:

#### 2.01 Materials:

- A. Two (2) coat application
  - 1. Block filler:
    - a. Glid-Tile No. 5512 Epoxide block filler, an epoxy ester, moisture-resistant block filler containing minimum of 65% solids by volume.
    - b. Pitt-Glaze high solid block filler (16-9).
    - c. Sanitile's Polyester base coat.
  - 2. Finish Coat:
    - a. Glid-Tile no. 5569/5597 Epoxide Gloss or Glid-Tile No. 5598/5597 Epoxide Semi-Gloss containing minimum of 60% solids by volume (mixed: Epoxide Enamel and Converter).
    - b. Pitt-Glaze High Solids Polyester-poxy Coating; or
    - c. Sanitile's Polyurethane finish coat.
  - 3. Colors: As selected by architect
  - 4. Single Supplier: To insure compatibility of layers.

### 3.0 EXECUTION:





3.01 Preparation of Surfaces:

- A. All surfaces shall be clean-free of dirt, grease and foreign matter that would adversely affect the adhesion, finished appearance or protective properties of special coating.
- B. If for any reason the surface cannot be properly prepared, the condition shall be reported to the General Contractor or Architect, who will be responsible for rectifying the unsatisfactory condition.
- C. Remove all burrs, nibs and mortar spatter and loose masonry by dressing with Carborundum tool or block fragment. Remove any efflorescence by muriatic acid wash and rinse with cement. Scrape all joints to remove excess mortar. Brush away all loose dust and residue.

3.02 Application:

- A. Block Filler:
  - 1. Glid-Tile No. 5512, Epoxide Block Filler applied at a rate not to exceed 70 square feet per gallon, applied to completely fill all pinholes and voids; yield 10 to 12 mils average dry film thickness; or
  - 2. Pitt-Glaze block filler applied to give approximately 16 mils dry film sand filler lightly after dry to remove all nibs. Filler to be applied by roller or spray followed by rolling; or
  - 3. Sanitile applied at rate of 65-75 sq. ft. per gallon
- B. Finish Coat:
  - 1. Glid-Tile No. 5596/5597 Gloss or 5598/5597 Semi-Gloss, Epoxide Enamel applied at a rate not to exceed 115 square feet per mixed gallon roller or 100 square feet per mixed gallon spray; yield 6.5 to 7.5 mils dry film thickness.
  - 2. Pitt-Glaze high solid polyester-epoxy top coat applied at rate of 176-265 sq. ft. per gallon, approximately 6 mil dry film thickness.
  - 3. Sanitile applied at rate of 200-225 sq. ft. per gallon.
- C. End Result: A smooth Tile-like, hard surface free of sags, runs, craters, pinholes, or other defects.
- D. Provide two (2) finish coats on first two rows of blocks above floor in corridors and stairs.

3.03 Standard Samples:

Sample Wall:

- A. Prior to application of special coating, an entire wall shall be completed for inspection and approval by Corpus Christi Army Depot.
- B. Upon acceptance and approval by Corpus Christi Army Depot, said area shall become the "Standard of Quality" for all applications of coating for this project.
- C. Application Contractor shall be responsible for maintaining the approved quality throughout the entire application.

3.04 Field Control:



## 09000 - Finishes

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- A. Areas to be coated must be kept free of traffic and no other trade shall work in the area during application procedure.
- B. General Contractor shall provide sufficient electric power, light, heat and permit proper application of this coating.
- C. Installation of resilient floorings, carpeting and acoustic tiles shall be completed after the coating has been applied.
- D. Painting in adjoining areas such as door bucks, doors, etc. shall not be completed after the coating has been applied.

### 3.05 Adjust and Clean:

- A. Remove and replace all surfaces which have been damaged or improperly applied.
- B. Completely remove from Project Site all waste materials, rubbish, scaffolding and debris as a result of work performed under this Section.
- C. All areas in which work was performed under this Section shall be left "broom-clean".

END OF SECTION 09800



## SECTION 09900

### PAINTING

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and application of paint. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Application procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.1 Quality Assurance
  - 1.1.1 Include on label of containers:
    - A. Manufacturer's name
    - B. Type of paint
    - C. Manufacturer's Stock number
    - D. Color
    - E. Instructions for reducing, where applicable.
    - F. Federal specification number as specified.
    - G. Federal regulations for amount of lead in paint. (less than 0.06% lead in non-volatile ingredients).
    - H. VOLATILE ORGANIC MATERIELS: Provide paint and coating products to comply with applicable environmental regulations and local authorities. Federal numbers, where specified or referred to are for guidelines only.
    - I. INSTALLERS QUALIFICATIONS: A firm having minimum of two (2) years experience painting building projects of similar complexity and employing workmen skilled in the painting trade.
  - 1.1.2. Sampling of Materials:
    - A. When requested by the Contracting Officer, obtain test samples from material stored at project site or source of supply.
    - B. Furnish from materials designated by the Contracting Officer:
      - 1 qt. (0.946 liters) - From batches of 50 gal. (37.84 liters) or less
      - 2 qt. (1.892 liters) - From batches over 50 gal. (37.84 liters)
    - C. Select samples at random from sealed containers.
  - 1.1.3 General
    - A. Painting materials shall be factory mixed.
    - B. Varnish containers shall not exceed 5 gallon capacity.



## 09000 - Finishes

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- C. Rejected materials shall be removed from premises immediately.
- D. Materials shall be used without dilution, except for thinning as described in Par. 3.02 Application.

### 1.1.4 Field Quality Control

- A. Request review of first finished room, space, or item of each color scheme for color, texture and workmanship.
- B. Primer coat on one wall shall be inspected before finish coat is applied.
- C. Use first acceptable room, space or item as project standard for each color scheme.

### 1.2 Submittals (samples):

- A. Provide sample of each color and finish, under natural lighting conditions, in a location where each finish is to be applied.
- B. Provide samples of stained and varnished wood, in triplicate, for approval.
- C. No further work shall be done prior to approval of the samples as noted in A and B above.
- D. Submit sample of concrete floor hardener and statement of method of application, before order material. If approved, put down 4 ft. x 4 ft. sample, where directed, for testing.
- E. The Contracting Officer will require samples of painting materials taken from original containers, on premises, for laboratory testing. Furnish new, clean, friction top, thinned cans of one quart size for each sample. Mix contents of each container thoroughly before sample is taken.

### 1.3 Product Delivery & Handling

- A. Deliver in original sealed containers with labels legible, intact and unbroken.
- B. Deliver to project site or segregate at source of supply in advance of need to allow time for testing.

### 1.4 Storage of Materials

- A. the Contracting Officer will assign space on premises for storage of materials, tools, etc.
- B. Store only in assigned spaces.
- C. Provide one (1) approved chemical dry fire extinguisher equal to 20 lb. CO2 rating in all assigned rooms or locations where painting materials are stored.
- D. In addition to the above, provide three (3) standard size red fire pails with clean sand in above locations. At the completion of project, fire extinguishers and pails shall become property of Contractor.
- E. Maintain in clean condition, safe from fire hazards.
- F. Keep containers tightly closed.
- G. Protect floors with drop cloths or building paper.
- H. Remove oily rags, waste, empty containers from site each night.



- I. Provide Superintendent with one key for each space if spaces are to be kept locked when not in use.
- J. Store only acceptable materials on project site.
- K. Restrict storage to paint materials and related equipment.
- L. Comply with health and fire regulations.

1.5 Job Conditions

1.5.1 Environmental Requirements

- A. Comply with manufacturer's recommendations as to environmental conditions under which coatings and coating systems can be applied.
- B. Do not apply finish in areas where dust is being generated.

1.5.2 Protection

Cover or otherwise protect finished work of other trades and surfaces not being painted concurrently or not to be painted.

1.6 Definition of Terms

1.6.1 The term "painting" wherever used herein, means the application of all coatings such as paint, primer, enamel, varnish, shellac, oil, etc. as listed in the Painting Schedules.

1.6.2 The term "Painting" shall also include preparation of surfaces for such applications, and the clean-up as hereinafter specified.

1.6.3 The term "Walls" mean all surfaces from floor, or top of base, or top of wainscot, to ceiling or hung ceiling

- A. Include pilasters, breaks, jambs, reveals, returns, arches.
- B. Include hardboards, pegboards.
- C. Include free standing columns, low partitions.
- D. Include masonry or plastered interiors of wardrobes, cupboards and other enclosed spaces.

1.6.4 The term "Ceilings" means the general overhead horizontal surfaces.

- A. Include cornices, arches, soffits, stair soffits.
- B. Include beam and girder haunches.
- C. Include metal cover and boarder strips of acoustic tile.
- D. Include metal frame of ceiling lights.
- E. Include side faces of hung or furred ceiling.

1.7 Tests

1.7.1 Chemical and Physical tests will be made in accordance with "Standard Method of Tests" as specified in Federal specifications governing the particular materials



## 09000 - Finishes

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- 1.7.2 Two laboratory tests of each different paint material may be required by an approved laboratory selected by the Contracting Officer (see Paragraph. 1.2 Submittals).
- 1.7.3 Include in Bid Price, the cost of these tests.
- 1.7.4 Materials that do not meet test requirements will be rejected.
- 1.7.5 When replacement of rejected material has been delivered to site, samples of new material will be taken for tests.
- 1.7.6 Cost of additional tests, required because of rejection of materials, will be borne by the Contractor.
- 1.7.7 Materials will be further tested in accordance with Federal Specification TT-P-141b, but the right is reserved to use additional information to ascertain whether materials comply with the specifications. Materials will be subjected to tests as the work progresses.
- 1.7.8 Samples will be taken from painters' pails and from sealed containers in presence of the Contractor's representative at the site.
- 1.7.9 Materials which do not comply with the Specifications will be rejected and shall be removed from the premises when directed by the Contracting Officer.
- 1.7.10 Contracting Officer may direct to repaint surfaces on which rejected materials have been applied or he may make proper deductions from the contractor's payments due in accordance with the terms of the Contract and General Conditions.
- 1.7.11 Concrete floor hardener will be tested as follows:
  - A. Sample prepared as described in Paragraph 1.2 Submittals; when dry, will be submitted to an abrasion test, using a stiff wire brush. Sample shall polish without dusting.
  - B. Finished materials shall show penetration of at least 1/8 inch into concrete floor.
  - C. Failure to meet these requirements will be cause for rejection.
- 1.8 Guarantees
  - 1.8.1 Adherence of workmanship and materials to specification requirements shall be maintained for the one year contract guarantee period.
  - 1.8.2 There shall be no evidence of blistering, peeling, crazing, alligatoring, streaking, staining or chalking.
  - 1.8.3 Washing with mild soap and water shall remove dirt without blemishing the finish.
  - 1.8.4 Colors of surfaces shall remain free from serious fading; the variation, if any, shall be uniform.
  - 1.8.5 All defects, appearing within the guarantee period, shall be corrected by removal of the defective work and replacement as directed.
  - 1.8.6 All corrective measures shall be the Contractor's responsibility, and made at no extra cost to the Contracting Officer.
- 1.9 AVAILABLE MANUFACTURERS:

Contact the Contracting Officer for a current list of available manufacturers.
- 2.0 PRODUCT



- 2.1 Materials
  - 2.1.1 Federal Specifications
    - 2.1.1.1 Turpentine T-801C
    - 2.1.1.2 Mineral Spirits T-291F
    - 2.1.1.3 Linseed Oil (Raw) L-215
    - 2.1.1.4 Linseed Oil (Boiled) L-190
    - 2.1.1.5 Putty p-791a(1)
    - 2.1.1.6 Spar Varnish V-121G
    - 2.1.1.7 Exterior Wood Primer P-25 C
    - 2.1.1.8 Titanium, Zinc & Titanium Paint P-103B
    - 2.1.1.9 Aluminum Paint P-320 V-119
    - 2.1.1.10 Aluminum Paint (Interior) V-8lb. per gallon of vehicle
    - 2.1.1.11 Gloss Enamel E-489F(1)
    - 2.1.1.12 Smokestack Black Paint E-496b
    - 2.1.1.13 Iron-Oxide Paint P-31C
    - 2.1.1.14 Galv. Iron Primer P-041F
    - 2.1.1.15 Black Paint P-61D
    - 2.1.1.16 Interior Primer Sealer S-179a
    - 2.1.1.17 Enamel Undercoat E-543
    - 2.1.1.18 Interior Flat Paint P-47E
    - 2.1.1.19 Interior Semi-Gloss Enamel E-508b
    - 2.1.1.20 Interior Gloss Enamel E-506G
    - 2.1.1.21 Latex Base Paint P-29H
    - 2.1.1.22 Cement Floor Paint P-91(a) 1
    - 2.1.1.23 Colors in Oil P-381C(2)
    - 2.1.1.24 Stain S-711b
    - 2.1.1.25 Shellac S-300
    - 2.1.1.26 Interior Glass Varnish V-71f
    - 2.1.1.27 Cabinet Rubbing Varnish V-86C
    - 2.1.1.28 Knot Sealer Western Pine Specif. WP-578



## 09000 - Finishes

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- 2.1.1.29 Cement Floor Hardener Magnesium & Zinc. - Fluosilicate type; material and method to be approved before ordering
- 2.1.1.30 Acrylic Emulsion Exterior Paint P-0019a
- 2.1.1.31 Asphaltum Paint V51c
- 2.1.1.32 Zinc Chromate Primer P-63b
- 2.1.1.33 Lacquer L.57; Rubbing Type, for wood
- 2.1.1.34 Lacquer L.58 (1); Spraying type; General use
- 2.1.1.35 Lacquer L 26; Brush type
- 2.1.1.36 Paste Wood Filler F-336b
- 2.1.1.37 Plastic Wood Filler F-340
- 2.2 Colors
  - 2.2.1 Selection
    - A. The Contracting Officer will select colors of paints and finishes.
    - B. Color schedule will be issued to the Contractor after award of contract.
  - 2.2.2 Maximum Number of Colors & Tints.
    - A. Number of colors selected by the architect will not exceed those listed in Schedule below.
    - B. In addition, each coat shall have a slightly different shade than the succeeding coat to permit easy identification of the separate coats.
    - C. In general, the Contracting Officer will vary the color scheme in various rooms, and all other locations so that numerous color schemes will be used throughout the building.
- 3.0 EXECUTION
  - 3.1 Preparation:
    - 3.1.1 Clean all surfaces, before painting, to properly receive finish.
    - 3.1.2 Remove all foreign matter.
    - 3.1.3 Remove oil or grease with mineral spirits.
    - 3.1.4 Fill small holes or imperfections in plaster with patching plaster, and sand smooth when dry.
    - 3.1.5 Smooth exterior wood surfaces by sanding. Wash sap spots and knots with mineral spirits. Touch-up with knot sealer. Fill voids and nail holes with putty after prime coat is dry.
    - 3.1.6 Treat interior wood surfaces to be painted as in 3.1.5 above. Shellac may be used in lieu of knot sealer. If wood is to be varnished, first putty to match color or wood.
    - 3.1.7 Wire brush cement floors which are to receive hardener.
    - 3.1.8 Notify the Contracting Officer if condition of base work is unsatisfactory.





3.2 Application

3.2.1 Moisture Meter Test

3.2.1.1 Do not apply initial coating until moisture content of surface is within limitations recommended by paint manufacturer.

3.2.1.2 Reading shall be approximately 8% on meter.

3.2.1.3 Test surfaces with moisture meter at various areas e.g.: Top, bottom and middle of wall, especially where piping occurs and at exterior walls, in the presence of the Contracting Officer.

3.2.1.4 Moisture content shall be approved by the Contracting Officer before any work is started.

3.2.2 General

3.2.2.1 No work shall be performed where cement or plaster is being applied or is in the process of drying.

3.2.2.2 No work shall be performed in spaces which are not broom clean and free of dust and waste.

3.2.2.3 Apply paint materials to produce smooth finished surfaces, free of brush or roller marks, drops, runs, sags.

3.2.2.4 Paint materials shall be kept at proper and uniform consistency.

3.2.2.5 Thin only when necessary to achieve best results.

3.2.2.6 Thinners shall be turpentine, mineral spirits or material recommended by manufacturer of paint, and in quantity as recommended.

3.2.2.7 Excessive use of thinner as indicated by variation in absorption, lack of "hide", thickness of dry film, mottled or streaky coat, shall be cause for rejection. Correct as directed.

3.2.2.8 Thinning of varnish or aluminum paint prohibited.

3.2.2.9 Apply all coats with brush or roller (spraying will not be permitted) varying slightly the color of succeeding coats.

3.2.2.10 Brush out or roll on first or prime coat; work well into surface.

3.2.2.11 Each coat shall be inspected and approved and dry before proceeding with additional coats.

3.2.2.12 Allow at least 48 hours for enamels and exterior oil paint to dry.

3.2.2.13 The surfaces of interior woods and metals shall be sanded or rubbed between coats to assure smooth finish and proper adhesion of subsequent coats.

3.2.2.14 Avoid lapping of paint on glass, hardware, or other adjoining surfaces.

3.2.2.15 Apply no paint to operating units where sliding contact of metals is necessary for proper functioning of unit.

3.3 Clean-Up

3.3.1 Remove spots or defacement resulting from work of this Section.

3.3.2 Retouch all damaged surfaces to leave work in perfect finished condition.



## 09000 - Finishes

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- 3.3.3 If spots or defacement cannot be satisfactorily removed, and retouched, re-finish the surfaces as directed.
- 3.3.4 Free all operating units of painted materials and leave them clean and in proper working order.
- 3.3.5 Remove from premises all surplus paint materials, debris and any other rubbish resulting from the work.
- 3.3.6 The entire finished work must be free from imperfections and blemishes, and be in neat, clean and perfect condition.
- 3.3.7 Leave storage space clean and in condition required for equivalent spaces in project.
- 3.4 Painting Schedule
  - 3.4.1 Surfaces Not to be Painted
    - 3.4.1.1 Polished or bright metals: Aluminum, bronze, brass, chrome, nickel, stainless steel, copper
    - 3.4.1.2 Exterior: Brick , Stone, Masonry, Concrete, Cement.
    - 3.4.1.3 Glass
    - 3.4.1.4 Chain Link Fence Work
    - 3.4.1.5 Ceramic Materials
    - 3.4.1.6 Factory Pre-Finished Masonry Block.
    - 3.4.1.7 Resilient Flooring Materials; Wood Floors.
    - 3.4.1.8 Terrazzo; Marble; Bluestone
    - 3.4.1.9 Acoustical Tile
    - 3.4.1.10 Chalk Boards; Cork Boards; Bulletin Boards; Plastic Laminate
    - 3.4.1.11 Mechanical Equipment, Steel Shelving, and Cabinets, which are factory finished.
    - 3.4.1.12 General Construction Items with factory applied final finish.
    - 3.4.1.13 Factory finished Wood Doors.
    - 3.4.1.14 Acoustic Tile and Metal Pan Ceiling
    - 3.4.1.15 Pipe and Duct Spaces
    - 3.4.1.16 Oil Tank Enclosure
    - 3.4.1.17 Meter Room
    - 3.4.1.18 Concealed Ducts, Pipes and Conduit
  - 3.4.2 Schedule
    - 3.4.2.1 Plaster, Concrete and Masonry surfaces of walls and ceilings
      - a. Type "A"
        - 1 coat interior primer sealer; 1 coat interior flat paint



- b. Type "B"  
1 coat interior latex emulsion; 1 coat enamel undercoat;  
1 coat interior semi-gloss enamel
- c. Type "C"  
1 coat enamel undercoat; 1 coat interior gloss enamel.
- d. Type "D"  
2 coats latex paint

Location	Type
Executive Offices, Store Rooms , Stair Enclosures, Vestibules, Offices and Closets off same, Entrance Hall, Corridors, Cafeteria, Auditorium, Gymnasium, Library, Reproduction Rooms	A (Flat)
Toilets, Telephone Closet, Locker Rooms, Medical Suite, Public Areas, Laboratories, Preparation Rooms, Apparatus Rooms, Acid Rooms, Dark Room, Emergency Room, Laundry, other Industrial Space	B (Semi Gloss)
Shower Room and Dressing Rooms off same, Dishwashing Room, Kitchen Store Rooms, Can Washing Room, Janitor's Sink Closets.	C (Gloss)
All interior plaster, concrete, brick or block surfaces of walls and ceilings throughout the building not otherwise specified	D (latex)

#### 3.4.2.2 Interior - Metal Surfaces

- A. Steel Window Trim Tough-up with red ; 2 coats led, zinc and titanium paint.
  - o Touch-up with red ; 2 coats , zinc and titanium paint.
- B. Hollow Metal Doors, Trim, Partitions, Screens, Office Railing, Office & Demountable Partitions.
  - o Touch-up with red; 1 coat enamel undercoat; 1 coat semi-gloss enamel
- C. Exposed Structural Steel, Ornamental and Miscellaneous Metal (non galv. ferrous metals).
  - o 2 Coats , zinc and titanium paint
- D. Exposed Metal (Galv.)
  - o 1 coat galv. iron primer; 1 coat , zinc and titanium paint or 1 coat aluminum paint
- E. Wire Work; Expanded Metal Shelves (non galv ferrous metal)
  - o 2 coats , zinc and titanium paint
- F. Wire Work; Railings (galv)
  - o 1 coat galv. iron. primer; 1 coat zinc and titanium paint or 1 coat aluminum paint.



## 09000 - Finishes

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- G. Grilles; Access Doors and Frames
  - o 2 coats of aluminum paint, or enamel, as will be selected.
- H. Convector Enclosures
  - o 1 coat enamel undercoat, 1 coat interior semi-gloss enamel
- I. In Wardrobes (metal ceilings, Jamb and Head Sections, coat and Hat Hook Rack, Metal Shelves)
  - o 2 coats , zinc and titanium paint.
- J. Exposed Metal Duct-Work
  - o 1 coat galv. iron primer; 1 coat , zinc and titanium paint.
- K. Electric Panel Board Cabinets, Electric Boxes, Frames for Recessed Lighting Fixtures.
  - o 2 coats , zinc and titanium paint, or enamel, as will be selected
- L. Steel Stair Treads (except feralun)
  - o 2 coats , zinc and titanium paint, plus 1 coat aluminum paint at completion of job.
- M. Metal Corner Beads (in Type "D" spaces)
  - o Prime with galv. iron primer

### 3.4.2.3 Interior - Non-Metal Surfaces

- A. Bearing surfaces of Stiles of Wood Sash
  - o 1 coat boiled linseed oil after sash is painted.
- B. Wood Windows and Other Wood Surfaces
  - o One coat exterior wood primer (except on windows); 2 coats , zinc and titanium paint. apply an additional coat (3rd) on sills of wood windows at end of job; this also applies to interior surfaces of window assemblies.

### 3.4.2.4 Exterior-Metal Surfaces

- A. Projected Steel Window Trim. (not galv.)
  - Zinc Chromate Primer- 2 Coats of Gloss Enamel.
- B. C.I. Chimney Cap
  - 2 coats smokestack black paint
- C. Exposed Copper (except roof and flashing)
  - 1 coat of linseed oil rubbed dry.
- D. Structural Steel - Touch up with red ; 2 coats gloss enamel
- E. All Other Ferrous Metals
  - Touch-up with red ; 2 coats gloss enamel.



- F. All other Galvanized Metal (except wire fences) 1 coat galv. iron primer;  
1 coat , zinc and titanium paint.

Note: Painting schedules require painting of certain items which are installed by other prime Contractors. Also, prime Coats, Shop Coats of Field Coats, provided under other sections of work (see Par. 1.1) shall not be considered as one of the coats specified under this section of work.

3.4.2.5 Other Non-Metal Surfaces

- A. Finished Concrete Floors: 1st Coat- Concrete Conditioner,,2nd Coat-Polyurethane Coating,3rd Coat- Polyurethane Coating.
- B. Finish concrete Floors, Gloss Finish: 1st Coat- Polyamide/Epoxy paint, 2nd Coat- Polyamide/Epoxy Paint, 3rd Coat- Polyamide/ Epoxy paint.
- C. Cement Bases  
2 coats cement floor paint.
- D. Wood Window Trim, Chair Rails, Valance Strip  
Before installation, back-paint. After installation, 1 coat enamel undercoat; 1 coat semi-gloss enamel.
- E. Wall Surfaces Behind Wardrobes  
1 coat interior primer sealer; 1 coat flat paint.
- F. Tops of Wardrobes and Cabinets  
1 Coat semi-gloss enamel.
- G. Wood Folding Partitions (incl. trim and overhead tract enclosure).  
1 coat interior gloss varnish; 1 coat cabinet rubbing varnish, rub to dull finish with fine pumice and oil.
- H. Wood Stairs for Auditorium Platform or Stage (treads, risers, trim-moldings). Paint or varnish to match existing.
- I. Interior Woodwork
1. All oak woodwork (except wood flooring and wood doors), in addition to the staining and filling, lacquering or shellacking, specified to be done under other sections of work, shall be finished with one coat of flat or spar varnish as will be directed.
  2. All interior red or white birch woodwork throughout (unselected as to color) specified in Section 3.4.2.6B shall be given 2 coats of paint of egg shell gloss in addition to the shop coat.
  3. The select white birch wood finish in front of Auditorium platform and stage, shall be finished with one coat of "Satinlac" as distributed by Plywood Corp., steel wool lightly when dry, dust off and wax. See Section 3.4.2.6B.
- J. All other Interior Woodwork including Interior of Closets and Wardrobes (not specified above).



## 09000 - Finishes

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Same as room, where located.

- K. The interior of drawers shall be shellacked. Exterior sides of drawers shall be shellacked one coat.

- L Pegboard (Display Units)

1. One (1) coat boiled linseed oil.
2. Two (2) coats interior flat paint.
3. Back & Front.
4. Colors as selected

### 3.4.2.6 Lettering (inscriptions)

- A. Use "Normal Block" letters on all Inscriptions
- B. On all doors to egress stair enclosures, doors across corridors and doors between stairs and passages, there shall be painted on the lock stile on the side opposite the pull (both sides of double acting doors), and at the same height as the pull, a black panel full width of stile and 18 inches high on paneled doors and 5 inches wide on flush doors. The painting at top and bottom edge of plate shall be extended as is necessary in order to surround the hardware which otherwise will be partly in partly out of painted area. These painted push plates shall terminate in straight edges.

### 3.4.2.7 Stencil Number and Letter Work

- A. Provide black stenciled numbers at all coat and hat hooks in gymnasiums, dressing rooms, wardrobes, as directed.
- B. Numerals and letters shall be black, 6" high, spaced 3'-0" apart, 7'-0" above floor. Where gym bleachers are higher than 7'-0", markings shall be 12' above bleachers; where sill height is less than 7'-0" markings shall be immediately below sill. Numerals, beginning with "1" located 3'-0" from side wall, and running consecutively as far as length of wall permits, shall be painted on front wall; letters beginning with "A" located 3'-0" from front wall, running alphabetically as far as length of wall permits, shall be painted on the two (2) side walls. No markings required on folding partition.

- C. Shuffleboard

Numbers stenciled, 1-inch wide lines with porch & deck latex base type paint.

## 3.5 Existing Buildings

### 3.5.1 Work Included:

#### 3.5.1.1 Interior Work:

- A. Previously painted surfaces and surfaces primed by others. Except as otherwise specified prime where necessary and apply one finish coat to the entire work.
- B. Previously unpainted surfaces and surfaces from which previous coatings are specified to be removed - apply one prime coat and one finish coat to the entire work.



- C. Floors, base, treads, landings, platforms apply 2 coats to the entire work.
- D. Grained work and stained and varnished work, apply one prime coat and one finish coat to the entire work.
- E. Other interior work specified to be painted apply one prime coat and one finish coat to the entire work.
- F. Existing door checks shall be painted one coat of bronze or aluminum paint as directed.
- G. Existing cement floors and bases, (except coat bins, pipe and duct spaces fuel oil tank chambers) shall be painted one coat of cement floor paint.
- H. Remove all existing room numbers and lettering and repaint as directed.
- I. Include radiators; shields and guards, convectors, pipe coverings and casings, pipes, ductwork, conduits, grilles, recessed ceiling outlets, wire mesh guards, perforated peg board wall panels.

3.5.1.2 Exterior Work:

- A. Previously painted metal and metal primed by others: prime where necessary and apply one finish coat to the entire work.
- B. New ferrous metal and previously unpainted ferrous metal: apply prime coat and one finish coat to the entire work.
- C. Woodwork, new and existing, apply one prime coat and one finish coat to the entire work.
- D. Masonry, previously painted - prime where necessary and apply one finish coat to the entire work.
- E. Masonry, previously unpainted - apply one prime coat and one finish coat to the entire work.
- F. Other exterior work specified to be painted apply one prime coat and one finish coat to the entire work.
- G. Finish coat only need to be applied to putty and caulking compound provided this coat gives a uniform full covering film free from solvent burns or other discoloration. Apply additional coats where necessary to cover thoroughly and eliminate discoloration. Prime rabbets at location of new putty and allow to dry thoroughly before applying putty.

3.5.1.3 Stained and Varnished Work:

- A. Existing stained and varnished work specified to be varnished - apply two coats of spar varnish to counter tops, base boards, chalk troughs, window stools, toilet room doors, shower and locker room doors, wood hand rails. Apply one coat of interior varnish to all other existing stained work.
- B. Existing stained and varnished work specified to be refinished - apply stain, fill, shellac, and two coats of varnish. Type of varnish for the various items shall comply with requirements of the preceding paragraph (A) above.



## 09000 - Finishes

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- C. New woodwork specified to be stained and varnished - apply stain, fill (open grain wood) shellac and two coats of varnish. The type varnish for the various Items shall comply with requirements of paragraph (A) above.

### 3.5.1.4 Blond Finish Work:

On new woodwork specified to be blond finished and on existing blond finished woodwork specified to be refinished apply base coat of white pigmented sealer thinned 20% with turpentine and 2 coats lacquer. One existing blond finished work specified to be lacquered apply 2 coats lacquer.

### 3.5.2 Coats Require:

- 3.5.2.1 The number of coats specified herein are minimum requirements. Apply as many additional prime and finish coats as required to insure that cracks, burns, suction spots, putty filling, plaster repairs, stains and other defects do not show through the finish and as required to protect ferrous metal from corrosion.

- 3.5.2.2 Unless otherwise noted, the number of coats specified herein are in addition to shop applied coats.

- 3.5.2.3 "Prime where necessary" shall spot prime or prime such surfaces over-all to achieve a final finish to the satisfaction of the Contracting Officer .

### 3.5.3 Work Omitted:

Unless otherwise specified in the Schedule or the Amendments, omit painting and finishing of the following:

- 3.5.3.1 Previously unpainted non-ferrous metal, stainless steel, glazed, polished marble; previously unpainted salt glazed and baked enamel brick work.

- 3.5.3.2 Previously unpainted cement, asphalt and wood flooring, movable furniture, fixed seats and desks, demonstration tables, home economics room counters, shop benches, interior gym bleachers, concealed rough woodwork.

- 3.5.3.3 Interior of the following cabinets, closets, spaces:

- A. Book cabinets, supply cabinets, display cabinets.
- B. Existing book rooms and book closets.
- C. Existing supply closets and storage closets and store rooms.
- D. All lockers except in built-in wood teachers' lockers.

- 3.5.3.4 All work finished in baked enamel.

- 3.5.3.5 New galvanized chain link fences and new galvanized wire guards. Does not apply to new parts and repairs to existing fences and guards.

- 3.5.3.6 Acoustical tile and acoustical plaster.

- 3.5.3.7 Interior of the following: dust chute, pipe and duct spaces, elevator shafts, dumb-waiter shafts.

- 3.5.3.8 Murals, games lines, traffic lines.

- 3.5.3.9 Bells, gongs, shade cords, metal parts in sliding contact.





- 3.5.3.10 Fire alarm boxes and clocks.
- 3.5.3.11 Boiler rooms, coal rooms, blower rooms, elect. service vaults, switch board rooms, meter rooms and incinerator rooms.
- 3.5.3.12 Interior of Roof tank house and attic spaces.
- 3.5.3.13 Cast iron and wrought iron caps on masonry chimneys.
- 3.5.3.14 Elevator cabs and elevator entrance doors.
- 3.5.4 Removal of Existing Work
  - 3.5.4.1 Remove wire guards, screens, grilles, and similar items as necessary to paint properly all surfaces, windows and doors, behind these items.
  - 3.5.4.2 Remove and paint behind pictures, signs, shades, drapes, furniture, cabinets, lockers and similar items which are not secured to walls.
  - 3.5.4.3 Unless otherwise specified, radiators, convectors, univents need not be removed providing all visible surfaces of these items and visible surfaces behind same as properly painted.
  - 3.5.4.4 Carefully mark removed work for identification and replace in the original location unless otherwise directed.
- 3.5.5 Cleaning.
  - 3.5.5.1 Broom clean all spaces and dust all surfaces specified to be painted or finished before applying any coatings.
  - 3.5.5.2 Upon completion of work remove from the premises, all surplus painting materials, equipment, debris.
  - 3.5.5.3 Remove paint daubs, oil stains, spatters and the like resulting from the work of this Contract as they occur.
  - 3.5.5.4 Retouch finished work where damaged.
- 3.5.6 Responsibility.
  - 3.5.6.1 The application of painter's finish to any surface shall be taken to indicate that the Contractor considers such surfaces suitable for a first-class finish.
  - 3.5.6.2 Do not apply painter's finish in any locations until the work of other Contractors in such locations which might damage the new finish is completed.
  - 3.5.6.3 Notify the Contracting Officer in writing regarding work by others which does not provide suitable surface for the new finish.
  - 3.5.6.4 In case of dispute regarding the suitability of any surface the Contracting Officer's decision shall be final and conclusive upon all concerned.
- 3.5.7 Preparation
  - 3.5.7.1 General
    - A. Prepare all surfaces as necessary to insure proper coating adhesion with the materials specified.



## 09000 - Finishes

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- B. This preparation shall be the sole responsibility of the Contractor and shall include cleaning, washing, sanding, chipping, scraping, wire brushing; removing existing finish, puttying, pointing, piercing, nailing, sealing, priming of any other process the Contractor considers necessary unless prohibited herein.
- C. Completely remove kalsomine, efflorescence, dampness, oil, grease, scale, dust dirt, loose and extraneous matter.
- D. Use appropriate cleaning solutions where necessary.
- E. Neutralize alkalinity.
- F. Before painting new galvanized surfaces, treat with chemical wash manufactured for the purpose (Lithoform, Stibloy or Solfo).
- G. Cut out and point up cracks, open any defective joints in masonry before painting.
- H. Securely bonded case in paint need not be removed provided such surfaces are otherwise prepared for the new coatings.
- I. Remove tape, stickers and the resulting marks.
- J. Remove tacks, projecting nails and screws.

### 3.5.7.2 Sanding:

All rough, loose, blistered, peeled, previously painted varnished surfaces shall be scraped or sanded to a smooth surface. Sand existing gloss finishes and new gloss and varnish undercoats as necessary to produce a satisfactory bonding surface for succeeding coats. New woodwork shall be sanded smooth and uniform with edges slightly rounded. Sand all putty stopping smooth and flush, removing all surplus.

### 3.5.7.3 Puttying

Fill cracks, open joints, nail holes and similar defects in existing woodwork specified to be painted or varnished with putty or plastic filler. Putty stop nail holes in all new woodwork specified to be painted or stained and varnished. Prime or seal all surfaces in contact with new putty. Interior putty shall be colored to match the finish.

### 3.5.7.4 Touching-up

- A. Spot prime defects in existing work and work primed under other paragraphs of work, as necessary to produce an even plane in the new finish.
- B. All worn, scaled, blistered, crackled and discolored places in the existing stained and varnished work specified to be revarnished shall be scraped, shaded, filled and touched up with stain as required to equalize the color.
- C. Touch-up and equalize the color of new woodwork specified to be stained and varnished where damaged, due to job fitting and trimming.
- D. Touch-up all pitch streaks and knots in woodwork with shellac.

### 3.5.7.5 Plaster Surface Defects

- A. Repair all surface defects in existing sound, securely bonded plaster specified to be painted.



- B. Sand, cut, scrape, prime, spackle, putty these defects as necessary to produce true even surfaces. These surfaces defects shall include:
1. Fire, hair and other cracks less than 1/16 inch wide.
  2. Small imperfections in plaster finish coat and
  3. Scratches, roughness and similar defects which can be prepared and repaired by the above mentioned methods. When such repairs are dry and hard, sand smooth and flush with adjoining sound surfaces.

3.5.7.6 Priming

Apply as many prime coats and touch-up where necessary to insure that cracks, burns, suction spots, putty filling, plaster repairs, stains and other defects do not show through the finish and as required to protect ferrous metal from corrosion. Do not use shellac, glue size or similar materials.

3.5.7.7 Wood Sash

Clean and oil pulley stiles of wood sash with one coat of stained boiled linseed oil at completion of painting of sash.

END OF SECTION 09900



## SECTION 09950

### WALL COVERINGS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of vinyl, cork, fabric, and flexible wood wall coverings. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.1 Manufacturer: Vicrtex Guard or approved equal.
- 2.0 PRODUCTS:
- 2.1 Vinyl Wall Covering: Wall covering shall conform to Fed. Spec. CCC-W-408, Type I, II, or III as required. A polyvinyl fluoride film, 1/2 mil thick, shall be factory-applied to the wall covering as required. The film shall conform to Fed. Spec. L-P-IO4O, Type I, Grade B, Class 2. Total weight: 8 oz./sq.
- 2.2 Cork Wall Covering shall be either sheet cork in standard 24-inch by 36-inch sheet size, or sheeting composed of a cork sheeting material - factory-bonded to a fabric backing. Wall covering material shall be either 20 ounces per lineal yard or 24 ounces per lineal yard and 36 inches wide, as required. When tested in accordance with ASTM E 84, the fire hazard classification of cork wall covering shall be not more than the following: flame spread - 15; fuel contributed - 0; and smoke contributed - 25.
- 2.3 Fabric Wall Covering shall be natural woven fabric bonded to a paper backing. Fabric materials shall be treated for stain and mildew resistance and shall be a minimum of 27 inches wide. All fabric wall coverings shall be Class A flame-rated and tested in accordance with ASTM E 84 and shall bear the UL label and marking indicating ASTM E 84 fire hazard classification. Wall covering shall be fabric, medium weight.
- 2.4 Flexible Wood Sheets shall be composed of genuine wood veneer bonded to a clay-filled cotton backing fabric to form a flexible wall covering in sheets not less than 12 inches wide, factory matched and numbered in sequence for spaces as required. Materials shall be provided with UL label and marking indicating fire hazard classification of wall covering, as determined by ASTM E 84. Materials shall be provided with the following fire hazard classifications: flame spread - not more than 10; fuel contributed - not more than 0; and smoke developed - not more than 0.
- 2.5 Primer and Adhesive shall be mildew-resistant and non-staining, as recommended by the wall covering manufacturer.
- 2.6 Wainscot Caps shall be aluminum extrusions.
- 3.0 EXECUTION:
- 3.1 Wall Covering Materials shall be acclimatized by removing from packaging in area of installation not less than 24 hours before application.



## 09000 - Finishes

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- 3.2 Prime and Seal Substrates in accordance with wall covering manufacturer's recommendations for type of substrate. Surface sealer shall be applied to gypsum wallboard to permit future removal of wall covering without damage to paper facing.

END OF SECTION 09950



## 09000 - Finishes

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### SECTION 09956

#### CORNER GUARDS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of corner guards. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Vinyl Corner Guards: Shall be constructed of .078 high impact vinyl. Impact ratings shall not be less than 27.9 based on ASTM D-256.
- 2.2 Aluminum Corner Guards: Aluminum shall be 16 gauge and conform to ASTM B-221-83.

END OF SECTION 09956

END OF SPECIFICATION SECTION 09 - Finishes



## SECTION 10150

### COMPARTMENTS AND CUBICLES FOR SHOWER AND TOILET ROOMS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of plastic and metal toilet partitions, urinal screens, and shower and dressing compartments. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.1 Manufacturers:
- A. Flush Metal Partition Corp., Long Island City, NY
  - B. Metpar Steel Products Corp., Westbury, NY
  - C. Global Steel Products Corp., Deer Park, NY
  - D. Santana Products Co., Inc., Scranton, PA.
  - E. Or approved equal.
- 1.2 SUBMITTALS
- 1.2.1 Shop Drawings: Submit shop drawings for fabrication and erection of Compartment and Cubicles assemblies not fully described by product drawings, including plans, elevations, detail of all fastening devices and accessory reinforcing plates, templated, and instructions for installation of anchorage devices built into other work.
- 1.2.2 Product data: Submit manufacturer's detailed technical data for materials, fabrication, and installation, including catalog cuts of anchors, hardware, fastenings, and accessories.
- 1.2.3. Certification: Submit certification that materials furnished comply with requirements specified.
- 1.2.4 Maintenance Instructions: Manufacturer's printed Instructions for maintenance of installed Work.
- 1.2.5 Samples: Submit a color chart with the manufacturer's full range of Standard colors. Provide 4" square samples of color and finish of materials along with any of the manufacturer's hardware samples, upon request.
- 1.2.6 Warranty: Written, 10 year against breakage, corrosion and delamination; replaced without charge, excluding labor.
- 1.3 QUALITY ASSURANCE: Take field measurements prior to preparation of shop drawings and fabrication, where possible, to ensure proper fitting of Work. Allow for adjustments within specified tolerances in the taking of field measurements. Furnish inserts and anchorages which must be built into other Work for installation of compartments and related Work; coordinate delivery with other Work to avoid delay.



## 10000 - Specialties

- 1.4 DELIVERY, STORAGE AND HANDLING: Deliver, store, and handle compartments as recommended by the manufacturer, to protect from damage.
- 2.0 PRODUCTS:
- 2.1 Plastic Toilet Partitions and Urinal Screens:
  - A. Sheet material construction: fabricate all materials, (panels, pilasters and seats) from polymer resins, plus fire retardants with class "A" ratings for Flame Spread and Smoke Developed.

Plastic: F.R.H.D.P.E. Polymer 5753 (Santana Series 3000) fabricated from Polymer Resins compounded under high pressure, forming a single component section which is waterproof, corrosion-proof, impact resistant, non-absorbent, with a self-lubricating poly-glaze surface that is resistant to marking with pens, pencils and other writing instruments.

Fabricate sheet material with homogeneous color throughout. Panels, Pilasters, and Seats: 1" thick with all edges machined to a radius of 0.250" and with all exposed edges free of saw marks. To ensure mar-free finish, cover all plastic material with protective plastic film.
  - B. Toxicity: Upon exposure to fire, material must not produce products of decomposition or combustion that are more toxic than those given off by wood or paper when decomposing or burning under comparable conditions. Provide approved toxicity report.
  - C. Finish of plastic materials: "PLASTI-GLAZE 280". Colors: selected by the Contracting Officer from manufacturer's standard colors.
- 2.1.2 Pilasters: Minimum of 1" thick, same construction and material as panels.
- 2.1.3 Pilaster Shoes
  - A. Shoe: Stainless steel (18-8, Type 304, 14 gauge) 3" high, secured to the pilaster with tamper-proof one way sex bolts.
  - B. Secure shoe to the floor with 4" galvanized steel screw. Provide concealed leveling bolts for proper leveling.
- 2.1.4 Hardware
  - A. Provide each toilet compartment with all hardware, door hinges, latch stop and keeper, and all necessary fittings and fasteners for a complete installation.
  - B. Furnish Hardware for each compartment in partition system, as follows:
    - a. Cutout inset type hinges, adjustable to hold door open at any angle up to 90 degrees; gravity type, spring-action cam type, or concealed torsion rod type.
    - b. Latch unit, designed for emergency access, with combination rubber-faced door strike and keeper.
    - c. Coat hook with combination hood and rubber-tipped bumper.
    - d. Door pull.
    - e. Paper holders and reinforcement as required.
    - f. Reinforcement for grab bars.





### 2.2 Metal Toilet Partitions and Urinal Screens:

- 2.2.1 Toilet Enclosures shall conform to Federal Specification RR-P-1352, floor mounted, headrail braced. Finish surface of panels shall be baked enamel, in color as required by the Contracting Officer. Panels to receive toilet paper holders or grab bars shall be reinforced for the reception of the items required.
- 2.2.2 Room Entrance Screens shall conform to Federal Specification RR-P-1352, floor mounted, headrail braced. Finish surface of screens shall be baked enamel.
- 2.2.3 Urinal Screens shall conform to Federal Specification RR-P-1352, floor mounted. Finish surface of screens shall be baked enamel. Width of shall be, as required by the Contracting Officer.

### 2.3 Shower and Dressing Compartments:

- 2.3.1 Plastic: Same construction, material and design as toilet partitions and urinal screens.
- 2.3.2 Metal: Same construction, material and design as toilet partitions and urinal screens.
- 2.3.3 Accessories: Each dressing compartment shall be provided with the following accessories: shower curtain rod, curtain, hooks, soap dish, and wood seat.
- 2.3.4 Shower Receptor shall be precast terrazzo, made of marble chips cast in white Portland cement. Provide wrought brass drain bodies cast integrally in receptor. Drain bodies shall provide for caulked lead connection not less than one inch deep to a two-inch pipe, with a removable type stainless steel strainer. Shower receptor curb shall be rabbeted 1 inch deep to receive steel shower walls. Receptors shall have an integral steel flange, 6-inch maximum height, on all sides except at threshold location.

### 2.4 Anteroom Screens:

- 2.4.1 Same construction and finish as the metal or plastic toilet partitions, as required.
- 2.4.2 Door hinges and stops for doors. In addition provide a cast pull 4-inches in nominal length and 2 3/4-inch x 10-inch push plate.

### 2.5 Painting:

- 2.5.1 Prime Coat: All metal panels, doors, pilasters sprayed with rust inhibitive primer, complying with Fed. Spec. TT-P-636.
- 2.5.2 Second Coat: Semi-gloss enamel sprayed and baked on, complying with Fed. Spec. TT-E-529.
- 2.5.3 Finish Coat: Semi-gloss enamel sprayed and baked. Color as selected by the Contracting Officer.

### 3.0 EXECUTION:

#### 3.1 Installation:

- 3.1.1 Erect compartments, and related items in a rigid substantial manner, straight and plumb, and with all horizontal lines level.
- 3.1.2 Clearance at the wall shall be approximately 1 inch for panels and 1 inch for pilasters.
- 3.1.3 All drilling, cutting and fitting to room finish shall be concealed in the finished work.



## 10000 - Specialties

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- 3.1.4 Clearance at vertical edges of doors shall be uniform from top to bottom and shall not exceed 3/16 inches. Doors shall be free of warp and wind.
- 3.2 Adjusting:
  - 3.2.1 Adjust hardware and leave in perfect working order.
  - 3.2.2 Adjust door hinges to hold door open at approximately 30 degrees.
- 3.3 Patching: Field touch-up of scratches or defaced enamel finish will be permitted only if it is approved by the Contracting Officer. Otherwise defective materials shall be rejected and replaced with new materials.
- 3.4 Cleaning: Remove all protective maskings and clean surfaces, leaving them free of soil and imperfections.

END OF SECTION 10150



## SECTION 10290

### PEST CONTROL

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation, of materials for pest control. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS: One of the following materials shall be used for pest control:
  - 2.1 Benzene Hexachloride, 0.8 percent gamma isomer concentration in a water emulsion.
  - 2.2 Chlordane, 1.0 percent concentration in a water emulsion.
  - 2.3 Heptachlor, 0.5 percent concentration in a water emulsion.
- 3.0 EXECUTION:
  - 3.1 Immediately prior to placing concrete floor slabs on grade and basement slabs for structures and immediately prior to backfilling around foundation for structures with basements or crawl spaces, soil treatment shall be applied as hereinafter specified. Soil treatment agents shall be delivered to the jobsite in sealed and labeled containers. Labels shall bear the manufacturer's warnings to be observed in the handling and use of soil treatment materials.
  - 3.2 Soil treatment shall be applied in accordance with the precautions on the label and in the following minimum quantities:
    - 3.2.1 Under Slabs on Grade, 1-1/2 gallons per 10 square feet as overall treatment. In critical areas such as around utility openings for pipes, ducts, and conduits, 0.5 gallon per square foot shall be applied. Along the exterior perimeter of the slab and under expansion joints, 2 gallons per 5 linear feet in a strip 1 foot wide shall be applied.
    - 3.2.2 Foundation Walls of Structures with Basements, 2 gallons per 5 linear feet per foot of depth from finished grade to top of footings in a strip 1 Foot wide on exterior side at each elevation as follows: near level of top of footings before any backfill is placed, as each 1-foot lift of backfill is completed, and just below finished grade. Two gallons per 5 linear feet in a strip 1 foot wide shall be applied under the basement slab next to perimeter footings.
    - 3.2.3 Foundation Walls of Structures with Crawl Spaces, 2 gallons per 5 linear feet per foot of depth from finished grade to top of footings in a strip 1 foot wide on exterior, with one-half of the application near level of top footings before any backfill is placed, and the remainder just below finished grade. Two gallons per 5 linear feet in a strip 1 foot wide shall be applied adjacent to the interior side of the foundation of buildings.

END OF SECTION 10290



## 10000 - Specialties

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### SECTION 10350

#### FLAGPOLES

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of flagpoles. Products shall match existing materials and or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- A. Manufacturers:
1. American Flagpole, East Setauket, Long Island, New York.
  2. Or approved equal.
- B. Design Criteria: Flagpole, bases and anchorage devices designed to resist a minimum 90 mph wind velocity with flag.
- 1.1 Submittals:
- A. Shop Drawing of Flagpole and Base:
1. General layout.
  2. Dimensions.
  3. Finishes.
  4. Foundation and base.
  5. Jointing.
  6. Anchoring and support systems.
  7. Cleats.
  8. Halyard boxes.
  9. Trucks.
  10. Finial.
  11. Base Collar.
- B. Samples: 2 in. x 4 in. (50 mm x 100 mm) furnish sample of actual finish.
- C. Manufacturer's Data: Furnish two copies of manufacturer's specifications and installation instructions for base and fittings required.
- 1.2 Product Delivery, Storage and Handling:
- A. Spiral wrap each flagpole with heavy kraft paper, wood strip and steel band or polyethylene wrap and pack in tube prior to shipment.
- B. Deliver flagpole in original wrappings and in two pieces.



- C. Store flagpoles, in original wrappings, in area protected from weather, moisture, and damage.
- D. Handle flagpoles so as to prevent damage or soiling.

2.0 PRODUCTS:

2.1 Flagpole:

- A. Material:
  - 1. Seamless extruded aluminum tubing.
  - 2. Alloy: 6063-T6.
  - 3. Heat treat and age harden flagpole.
- B. Type:
  - 1. Seamless, uniform, straight line tapered section above cylindrical butt section.
  - 2. Provide internal splicing, self-aligning sleeve of same material as flagpole for snug fitting, precision field joints.
  - 3. Provide air tight and water tight joints.
- C. Dimensions: Provide height flagpole as directed by the Contracting Officer. Setting depth shall be per manufacturer's standard details.
- D. Finish: Color anodized finish: AA-C22-A42, Class 1, of selected color.

2.2 Mounting:

- A. Ground Set Foundation Assembly:
  - 1. Base:
    - a. Cast aluminum flash collar.
    - b. Size base to accommodate butt diameter of flagpole.
  - 2. Foundation Sleeve: 16 ga. corrugated steel tube.
  - 3. Foundation Sleeve Plate: 1/2-inch thick steel plate.

2.3 Fittings:

- A. Finial:
  - 1. Type: Ball.
  - 2. Dimensions: Ball diameter: 8" or 10" dia. spun aluminum.
  - 3. Material: Flush seam 14 ga.
  - 4. Finish: Color anodized, finished to match flagpole.
- B. Truck Assembly: Aluminum ballbearing, non-fouling, revolving double truck assembly.
- C. Cleats:
  - 1. Quantity: Two.



## 10000 - Specialties

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2. Size: 9 in. (230 mm.).

3. Material: Aluminum.

D. Halyard:

1. Quantity: Two continuous halyards.

2. Size: No. 10.

3. Material: Polypropelene, white braided.

E. Swivel Snaps:

1. Quantity: Two per halyard.

2. Material: Aluminum with neoprene or vinyl covers.

F. Cleat Box:

1. Quantity: One.

2. Material: Aluminum.

3. Finish: To match flagpole.

4. Furnish complete with hasp for padlocks, hinged cover, staple, and tamperproof screws.

3.0 EXECUTION:

3.1 Inspection: Inspect foundations for proper depth and size of sleeve.

3.2 Preparation: Paint portions of flagpole below grade with heavy coat of bituminous paint.

3.3 Installation:

A. Install flagpoles, base assemblies, and fittings, in compliance with acceptable final shop drawings and manufacturer's instructions.

B. Provide positive lightning ground for flagpole installation.

3.4 Test And Adjust: Check and adjust installed fittings for smooth operation of halyards.

END OF SECTION 10350



## SECTION 10410

### DIRECTORIES, CHALKBOARD, CORKBOARD, COATING AND TRIM

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of Chalk Board, Cork Board, Directory Boards, Visual Aids Boards, and bulletin boards. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.1 Manufacturers:
  - 1.1.1 Gotham Division, Larchmont, N.Y.
  - 1.1.2 Aywon Wire and Metal Products, Brooklyn, N.Y.
  - 1.1.3 Claridge Products And Equipment Inc., Harrison, Arkansas
  - 1.1.4 Alliancewall Corp, Alliancewall Corp, Alliance, Ohio
- 1.2 Submittals:
  - 1.2.1 A 3" x 5" sample of each porcelain enamel writing surface showing color, texture, and thickness of porcelain coatings, gauge of metal, thickness and type of core material, and thickness of backing sheets.
  - 1.2.2 One of each type wall clip or anchoring device.
  - 1.2.3 1 pint adhesive and spotting compound.
  - 1.2.4 One of each type accessories specified (grounds, clips, clamps, shims).
  - 1.2.5 Trim, chalk tray, joint splice and map rail 6 in. long.
  - 1.2.6 3" x 5" sample of each color corkboard.
  - 1.2.7 Submit for approval prior to installation.
- 2.0 PRODUCT:
  - 2.1 Chalkboard: Porcelain Enamel Steel Face: Two coats special composition of ceramic porcelain fired on 28-gauge steel (minimum) with special control and shall be manufactured in accordance with Porcelain Institute Standards for architectural porcelain.
    - 2.1.1 Writing Surface:
      - 2.1.1.1 Two (2) coats ceramic designed specifically to take chalk erasures in a non-glazing soft finish. Chalkboard must be capable of supporting display papers by means of magnet.
      - 2.1.1.2 Writing surface shall resist wear, shock, scratches, abrasions and shall not crack, dent or shatter.
    - 2.1.3 Core:



## 10000 - Specialties

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- 2.2.3.1 Porcelain on steel shall be laminated to tempered hardboard core with sheet metal backing.
- 2.2.3.2 Overall thickness of chalkboard shall be 1/4-inch minimum.
- 2.2 Corkboard:
  - 2.2.1 Corkboard shall be 1/4" thick vinyl-impregnated, smooth finish plastic sealed, color through and through.
  - 2.2.2 Composition Hardboard backing, 1/4" thick.
  - 2.2.3 Adhesive as recommended by manufacturer.
  - 2.2.4 Nails: Masonry.
  - 2.2.5 the Contracting Officer will select approximately seven (7) colors of corkboard.
  - 2.2.6 the Contracting Officer will prepare schedule of color of cork selected for various locations.
- 2.3 Aluminum Trim:
  - 2.3.1 Aluminum work shall be extruded sections as indicated on details and shall be of alloy 6063 for extruded members and 43 for any castings, finish shall be equal to Alumilite 204-CI for extrusions, and 704 for castings, as specified by the Aluminum Co. of America.
  - 2.3.2 Height shall be as directed by the Contracting Officer.
  - 2.3.3 Trim members shall be in single length, straight and true, free of defects. Top members of chalkboard trim in front of each room shall be equipped with 8 sliding map hooks, 2 sliding map or roller brackets, sliding flag holder, and map rails, all as indicated by the Contracting Officer. Pegboard trim also as indicated by the Contracting Officer.
- 2.4 Visual Aid Boards shall have a white porcelain enamel writing surface.
- 2.5 Directory Boards shall be grooved and covered with felt, vinyl, or rubber. Boards shall be fabricated of one piece of material. Space grooves at 1/4 inch O.C. to receive changeable letters or changeable name bases, as required.
- 2.6 Glass for Encased Boards shall be laminated glass, tempered glass, acrylic sheeting, or polycarbonate sheeting.
- 2.7 Locks and Keys for Glass-Encased Boards shall be of the desk tumbler type with two keys.
- 3.0 EXECUTION:
- 3.1 All Materials shall be installed as per manufacturer's recommendations.

END OF SECTION 10410





## SECTION 10440a

### OVERPASS SIGNS

- 1.0 DESCRIPTION: This specification covers the furnishing and installation of materials for overpass signs. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.02 REFERENCED DOCUMENTS
- Industry Standards
1. American National Standards Institute (ANSI): B18.2.1, Square and Hex Bolts and Screws Inch Series Including Hex Cap Screws and Lag Screws
  2. American Society for Testing and Materials (ASTM):
    - A36 Structural Steel
    - A307 Carbon Steel Externally and Internally Threaded Standard Fasteners
    - B209 Aluminum-Alloy Sheet and Plate
    - E84 Surface Burning Characteristics of Building Materials
  3. American Welding Society (AWS): D1.1, Structural Welding Code
  4. Steel Structures Painting Council (SSPC): SP-2, Hand Tool Cleaning
- 1.02 HANDLING AND STORING: Handle and store sign and mounting frame preventing damage.
- 2.0 PRODUCTS
- 2.01 OVERPASS SIGN
- A. Backing plate: Flat aluminum sheet conforming to ASTM B209, Alloy 6061, Temper T4, and not thinner than 1/8 inch.
  - B. Signface
    1. Material: Fiberglass reinforced polyester (FRP) not thinner than 1/8 inch; J. H. Mathews Architectural Div.'s VOMAR. Embed messages and graphics in FRP protecting against ultra- violet rays, and degradation and discoloration.
    2. Burn rate of FRP back-up resin, as determined by ASTM E84: Not more than 25.
    3. Finish tensile strength of cured signface: Not less than 12,000 psi.
  - C. Adhesive: General Electric Co.'s RTV-108 Silicone Adhesive, or accepted equivalent.
  - D. Mounting frame: Steel conforming to ASTM A36.



## 10000 - Specialties

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- E. Bolts for fastening sign assembly to mounting frame: 5/16 inch diameter, hex head, ASTM A307, Grade A, threaded Class 2A, ANSI B18.2.1, galvanized after threading; having sufficient length to extend 1/4 inch beyond nut; self-locking class 2B threaded steel hex nut galvanized after threading; and plastic insert.
- F. Dielectric insulating washers between sign and mounting frame: McMaster-Carr Co.'s Teflon Flat Washer No. 95630A218.
- G. Paint for mounting frames: See PAINTING.
- H. Anchorage
  - 1. To concrete: McMaster-Carr Co.'s Cinch Clinch Anchor Studs No. 91578D302.
  - 2. To steel: Submerged arc welding electrode recommended by AWS D1.1.
- I. Fabrication: Laminate signface to backing plate with specified adhesive.

### 3.0 EXECUTION

#### 3.01 INSTALLATION

- A. Install mounting frame level, true, and plumb on beam. Bolt assembled sign to mounting frame after welding and painting operations have been completed.
  - 1. Field-prepare mounting frame for painting in accordance with SSPC SP-2. Prime and coat frame; total dry film shall be not thinner than 4.5 mils.
  - 2. Field-weld mounting frame to steel girders in accordance with AWS D1.1. Touch-up damaged girder and frame paint.
- B. Installed products shall be true and be free from warps, dents, and other irregularities.
- C. Install dielectric insulating washers resulting in aluminum and steel being electrically isolated from each other.

#### 3.02 ADJUSTING AND CLEANING: Eliminate warps, dents, and other irregularities, and tighten nuts. Clean installed products.

#### 3.03 FIELD QUALITY CONTROL: Faces of installed signs will be inspected, four weeks after installation, for evidence of discoloring, disintegrating of finish, peeling, bubbling, creasing, and faulty manufacturing or installation. Failing signs or parts will be rejected.

END OF SECTION 10440a



## SECTION 10440b

### REFLECTORIZED SIGNS

- 1.01 DESCRIPTION: This specification covers the furnishing and installation of materials for wayside decals and reflectorized signs for wayside, streets, utility locations, and parking lots. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.02 REFERENCED DOCUMENTS
  - U. S. Department of Transportation/Federal Highway Administration (DOT/FHWA): Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD)
- 1.03 JOB CONDITIONS
  - A. Surfaces and structures to, and on, which products will be affixed, placed, and installed shall be capable of supporting the products.
  - B. Sequencing
    - 1. Install wayside decals and signs, and utility location signs immediately after other wayside work has been completed in each project area and before area is electrified.
    - 2. Install posts in street and parking lot paved areas before paving.
    - 3. Install posts in unpaved areas after areas have been finish graded.
    - 4. Install signs after posts have been set in-place.
- 2.0 PRODUCT
- 2.01 STREET, WAYSIDE, UTILITY LOCATION, AND PARKING LOT SIGNS; DECALS
  - A. Blanks: aluminum of type, size, and shape indicated.
  - B. Reflective sheeting: Texas DOT for Type 1 sheeting having Level A reflective intensity.
  - C. Silk screen lettering paint and transparent process colors: Texas DOT.
  - D. Posts
    - 1. Drive type: Texas DOT.
    - 2. Pipe type: Texas DOT, Two-inch inside diameter.
  - E. Hardware: Texas DOT.
  - F. Fabrication
    - 1. Dimensions, colors, and reflectorizing: As indicated, and in accordance with MUTCD.



## 10000 - Specialties

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2. Size, style, and spacing of letters, numerals, symbols, and borders: As indicated, and in accordance with Texas DOT as supplemented by DOT/FHA's publication entitled Standard Highway Signs as specified in MUTCD 1978.

3. Workmanship: Texas DOT.

2.02 POST FOUNDATION: Class 3000 concrete.

### 3.0 EXECUTION

3.01 EXAMINATION: Examine surfaces and structures to, and on, which products will be affixed, placed, and installed.

3.02 PRELIMINARY WORK: Locate below grade utility lines whether belonging to the Contracting Officer, utility companies, or local governments.

3.03 INSTALLATION: Install in accordance with Texas DOT. Unless otherwise indicated, install not more than one sign on each post.

- A. Installed products shall be true-to-line and free from warps, dents, and other irregularities.
- B. Excepting brackets, supports, covers, escutcheons, and canopies which conceal attachment points, products installed against concrete, mortar, and other masonry surfaces shall clear those surfaces by not less than 1/4 inch.
- C. Attachment to building shall be rigid and secure. Supports shall be capable of supporting products.
- D. Install dielectric protection resulting in dissimilar metals being electrically isolated from each other.
- E. Place utility location sign on centerline of line being marked. Mark lines beginning and ending within Contracting Officer rights-of-way at their ends. Mark lines crossing Contracting Officer rights-of-way at a point near edge of subballast shoulder. Mark track underdrains at changes in direction and at outflows. Do not mark underdrains extending along bases or tops of retaining walls. If a sign location, as described above, results in a conflict with other underground facilities, place sign away from trackbed at a point near right-of-way line.
- F. Drive posts in ballasted sections a minimum depth of three feet into subballast.
- G. Clean surfaces on which decals are to be applied with solvent. Apply decals to, dust free surfaces in accordance with manufacturer's printed instructions.
- H. Sign location shall not vary more than one foot from indicated.

### 3.04 ADJUSTING AND CLEANING

- A. Eliminate warps, dents, and other irregularities, and tighten attachments.
- B. Clean installed products.

3.05 FIELD QUALITY CONTROL: Inspect signs and decals four weeks after installation, for evidence of faulty material and faulty application due to discoloring, disintegrating of finish, peeling, bubbling, and creasing.

### 3.06 MOUNTINGS



- A. Post
  - 1. Place posts plumb and in alignment.
  - 2. Secure posts with temporary supports where posts require concrete foundations; maintain alignment until the footing has cured.
  - 3. Where posts are mounted in paved areas, align edge between the footing and paved surface square and true.
- B. Wall
  - 1. Install expansion bolts to fit bolt holes of sign as indicated.
  - 2. Install sign flush to wall.
- C. Fence: Mount sign to fence with back-up strips and tamperproof bolts, nuts, and washers.
- D. Special support
  - 1. Install bracket attachments for mounting signs square, true, and plumb to existing structures.
  - 2. Restore exposed surfaces around sign to their original condition.

END OF SECTION 10440b



## 10000 - Specialties

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### SECTION 10440c

#### TRAFFIC SIGNAL SUPPORT SYSTEM

- 1.01 DESCRIPTION: This specification covers the furnishing and installation of materials for traffic signal support system. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.02 REFERENCED DOCUMENTS
- Industry Standards
1. American National Standards Institute (ANSI): C80.1, Rigid Steel Conduit, Zinc Coated
  2. American Society for Testing and Materials (ASTM)
    - A36 Structural Steel
    - A123 Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip
    - A126 Gray Iron Castings for Valves, Flanges, and Pipe Fittings
    - A153 Zinc Coating (Hot-Dip) on Iron and Steel Hardware
    - D365 Soluble Nitrocellulose Base Solutions
    - D635 Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position
    - D2466 Polyvinylchloride (PVC) Plastic Pipe Fittings, Schedule 40
    - F512 Smooth-Wall Polyvinylchloride (PVC) Conduit and Fittings for Underground Installation
  3. U.S. Army Corps of Engineers (CRD): C621, Non-Shrink Grout
- 1.03 QUALITY CONTROL: Equipment: Conduit-testing mandrel shall be two inches long and shall have diameter 1/4 inch smaller than conduit.
- 1.04 JOB CONDITIONS
- A. Install conduit and pull boxes under new sidewalk, pavement, and surfaced shoulder before placing paving.
  - B. Verify that conduits are free from obstructions and moisture before installing cable; pull a swab and wire brush through conduit until clean.
  - C. Disconnect existing traffic signals only after temporary signals have been installed, tested, inspected, and accepted. Do not open door of traffic signal control equipment cabinet.
- 2.0 PRODUCTS



- 2.01 TRAFFIC SIGNAL POLE ASSEMBLY: Strain pole type, some with street light brackets.
- A. Pole: Consisting of a tapered steel shaft with a cast steel base, handhole with cover, pole top, and anchor bolts and nuts. Pole shall be zero-gauge, 12 inches by 6.52 inches by 32 feet unless otherwise indicated.
    - 1. Weld a handhole reinforcing frame, complete with cover and not smaller than a four inches by six inches, into shaft 12 inches above base to facilitate wiring.
    - 2. Pole cap shall be of pressed steel and be affixed with 3/4 inch cap screws. Poles having street light brackets shall have wire entrance; entrance shall be Union Metal Co.'s Modification 17, or accepted equivalent.
    - 3. Install grounding nut for accommodating a threaded bolt or stud, not smaller than 1/4 inch 20 UNC, on inside of shaft immediately above bottom weld joining shaft to base.
    - 4. Install "J" hook inside pole and one to two inches below top of pole.
  - B. Base: One-piece cast steel conforming to ASTM A36, and with a yield strength of not less than 36,000 psi. Base shall telescope shaft. Furnish four cast iron removable ornamental covers conforming to ASTM A126, Class A, with each base; attach base to bottom of shaft with hex head cap screws. Bolt circle shall be as dictated by structural requirements of pole.
  - C. Anchor bolt: Capable of satisfying structural requirements of pole, and of resisting, at yield strength stress, bending moment of shaft at its yield strength. Bolt shall be not smaller in diameter than 1 1/2 inches nor shorter than 60 inches, shall have an L-bend at the bottom, and be threaded through the top six inches. Furnish four high-strength steel anchor bolts, each fitted with one square, one hex nut, and two round washers, for each pole. Galvanize threaded end and nuts in accordance with ASTM A153.
  - D. Hardware, and bolts, nuts, and washers other than those for anchoring pole shall be stainless steel, unless otherwise indicated.
  - E. Conduit terminating at top of foundations shall be close nipples extending four inches above foundation finish surface, and shall have galvanized pipe caps and clean insulated grounding bushings having push pennies.
  - F. Fabrication
    - 1. Form shaft from one-length of one-ply, best grade, hot- rolled, basic open-hearth steel sheet. Weld seam, and longitudinally cold-roll shaft under pressure flattening weld, eliminate evidence of weld, form a round tapered tube, and improve physical characteristics of the metal to ensure a yield strength 55,000 psi.
    - 2. Weld handhole reinforcing frame into shaft above base.
    - 3. Weld shoe to pole.
    - 4. Weld grounding nut on inside of shaft immediately above base weld point.
    - 5. Fit base onto lower end of shaft, and weld base to shaft with two continuous electric arc welds, one on inside of base at top of base and other on outside of base at bottom of shaft. Welds shall be not less than two inches apart. Welds shall develop full strength of shaft.



## 10000 - Specialties

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- 6. Galvanized assembled shaft, shoe, frame, grounding nut, and base after fabrication in accordance with ASTM A123.
- G. Traffic signal pedestal poles shall consist of aluminum octagonal base; Veped Catalog No. SE5033, or accepted equivalent. Shaft shall be seven feet of four-inch aluminum tube. Apply pipe dope to threads, and screw shaft into base.
- 2.02 CONDUIT AND CONDUIT FITTINGS NOT UNDER STREETS: Schedule 40 PVC plastic duct conforming to ASTM F512 and ASTM D2466. Installation materials and equipment shall conform to those listed in ASTM F512. Bends shall be long-sweep type having a radius not less than six conduit diameters. Elbows shall have a radius of not less than nine conduit diameters.
- 2.03 CONDUIT AND CONDUIT FITTINGS UNDER STREETS
  - A. Conduit: Either galvanized carbon steel or galvanized alloy steel containing 1.6- to two percent nickel and 0.75 percent to 1.25-percent copper; conform to ANSI C80.1. Determine thickness of zinc coating by referring to Reference Test included in Appendix to ANSI C80.1. Each section of conduit shall be approved by UL.
  - B. Fittings and couplings: Same type material as conduit to which fittings are connected. Expansion couplings shall have a factory-installed packing ring and pressure ring assembly preventing entrance of moisture when coupling is in-place, and with a grounding ring or a grounding conductor. Bends shall be long- sweep type with a radius not less than six conduit diameters. Caps shall be weatherproof.
- 2.04 PULL BOXES: Tested to temperature of minus 50 degrees F, and satisfy ASTM D635 flammability test. Pull boxes shall be rectangular with a material compressive strength of not less than 11,000 psi. Locking cover shall have a roughened top surface of 1/8 inch in relief; notches for removing cover from frame; and words TRAFFIC SIGNAL cast in the top surface with letters 1 1/2 inches high and 1/8 inch in relief.
  - A. TYPE A pull box and cover shall be reinforced to sustain a 5000 pound single axle load over a 10 inch by 10 inch area.
  - B. TYPE B pull box and cover shall be reinforced to sustain a 15,000 pound single axle load over a 10 inch by 10 inch area.
- 2.05 POLE AND CONTROL CABINET FOUNDATION
  - A. Concrete; Class 3000, NX
  - B. Reinforcement: CONCRETE REINFORCEMENT, NX
  - C. Formwork: CONCRETE FORMWORK, NX
- 2.06 GROUND RODS: Copper weld type, 3/4 inch diameter by ten feet long. Ground rod clamp shall be bronze.
- 2.07 GROUT: CRD C621.
- 2.08 TRENCH BACKFILL: EARTHWORK.
- 2.09 AGGREGATE BASE: BASE, SUBBASE, AND SUBBALLAST.
- 2.10 PULL-WIRE: No. 10 AWG galvanized steel, without kinks.





- 2.11 WIRE- AND CABLE-PULLING LUBRICANT: As recommended by wire and cable manufacturers.
- 2.12 TEE DRAINS: Pipe-reducing-tee having 1/2 inch side opening and 1/2 inch by four-inch pipe nipple.
- 2.13 CONCRETE: Class 3000.
- 3.0 EXECUTION
- 3.01 PRELIMINARY WORK
  - A. Trenching: EARTHWORK. Excavate straight, 18-inch wide trenches to a depth not less than 18 inches except that earth cover over conduit under pavement shall be 24 inches. Sheet and brace trenches. Route conduit trenches no closer than 12 inches from underground facilities not associated with electrical system. In conduit adjacent to walls, piers, and footings, separate with no less than four inches of either undisturbed earth or firmly-compacted soil. Cut bottom of trench no steeper than 0.25 percent; grade trenches from center of run to end of run to maintain that 0.25 percent all one way; do not create pockets. Compact trench bottom.
    - 1. If trench bottom is unsatisfactory, remove unsatisfactory material to depth determined by Contracting Officer, and fill created space with clean sand. Compact sand in layers not thicker than six inches, and to not less than 95 percent of relative dry density.
    - 2. If rock exists at or above, design elevation of trench bottom, remove rock to an elevation four inches below design elevation and fill space with clean sand. Compact sand to not less than 95 percent of relative dry density.
    - 3. If necessary to trench through pavement, sidewalk, or surfaced shoulder, remove surface, base, and subgrade.
  - B. Aggregate base: BASE, SUBBASE, AND SUBBALLAST.
- 3.02 INSTALLATION
  - A. Conduit
    - 1. Place conduit, penetrating foundation, in template position and retain in that position until concrete sets.
    - 2. Install a galvanized coupling or close nipple on conduit terminating at foundation top. Fit conduit with a pipe cap or a clean insulated grounding bushing having push-penny.
    - 3. Place adjacent conduits not closer than three inches in trench.
    - 4. Change from steel to PVC conduit only at pull boxes and at foundations.
    - 5. Install "tee" drains in conduit pockets and at lower ends of conduit.
    - 6. Install Schedule 40 PVC plastic duct in accordance with duct manufacturer's instructions.
    - 7. Ream ends of conduit after threads have been cut. Cut ends square and butt solidly in joints. Remove burrs and thoroughly clean conduit.
    - 8. Conduit joints shall be watertight.
    - 9. Install bushings on ends of conduit to protect conductors.
    - 10. Conduit intended for future use shall be thoroughly cleaned and deburred, with a No. 10 AWG galvanized steel pull wire installed, and open ends closed with weatherproof caps.



## 10000 - Specialties

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11. Test installed conduit with a mandrel in presence of Contracting Officer. Repair damaged conduit to satisfaction of Contracting Officer; remove conduit if not repairable, and install new conduit. Clean conduits through which mandrel has passed.

### B. Foundation

1. Forms: CONCRETE FORMWORK. Remove forms only after concrete has been in-place for not less than 24 hours.
2. Reinforcement: CONCRETE REINFORCEMENT.
3. Concrete: CAST-IN-PLACE CONCRETE.
  - a. Place concrete monolithically and against undisturbed earth.
  - b. Finish exposed concrete surfaces with a wood float; then brush with a wet, soft-haired brush.
  - c. Tops of foundations integral with or adjacent to sidewalks shall be flush with tops of sidewalks; tops of foundations elsewhere shall be two inches above surrounding grade or grade of curb near foundation.

- ### C. Pull box:
- Install boxes out of the line of traffic and out of wheelchair ramps. Covers shall be level with sidewalk; if no sidewalk exists, top of cover shall be two inches above surrounding ground. Bottom of pull box shall rest firmly on a 12- inch thick bed of coarse aggregate extending six inches beyond outside edge of pull box. Set pull boxes having one-inch conduit one foot from curb face and in-line with a curb construction joint.

- ### D. Anchor devices:
- Place anchor bolts in template position and retain until concrete sets.

- ### E. Signal pole:
- Install in accordance with pole manufacturer's printed installation instructions. Bolt pole to foundation. Tilt pole nine inches out-of-plumb, from bottom to top, away from center of intersection and secure with hex nuts. Pack space between foundation and pole base with grout after pole has been secured in-place.

- ### 3.03 BACKFILLING: EARTHWORK.
- Backfill conduit only after acceptance. Place backfill in layers not thicker than six loose inches, and compact each to 100 percent of maximum dry density.

END OF SECTION 10440c



## SECTION 10440d

### SIGNS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of signs. Materials shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.1 Submittals:
- A. A full size sample of a letter "R" shall be submitted to the Contracting Officer for approval before fabricating the work in the shop. Sample shall be finished as specified below. All finished letterings shall correspond in every detail with that of the approved sample.
  - B. Submit shop drawings of full inscription, scale 3" = 1' - 0" , showing style, spacing and method of securing.
- 2.0 PRODUCTS:
- 2.1 Cast-Aluminum Letters:
- A. Letters shall be of aluminum alloy 43; finish shall be equal to Alumilite 704, as specified by the Aluminum Company of America.
  - B. Castings of letters shall be of fine texture, unwarped and sound, all lines sharp and profiles accurate. Castings shall be of proper thickness to insure perfect work and strength required to face of wall with concealed anchors. Size and spacing of anchors as per direction of the Contracting Officer.
  - C. Aluminum shall be separated from dissimilar metal parts of anchors by a heavy coat of approved bituminous paint applied to the contact surfaces and allowed to dry before assembly.
- 2.2 Bronze Tablet:
- A. A cast bronze tablet, of medium statuary bronze finish, as per detail, shall be furnished and erected on wall where shown or directed. Letters shall be full block, square face with faces polished and lacquered. Ornamental work, molding, buttons, etc., shall be polished and lacquered; ground work shall be matted and all letters, molding, ornamental work, etc., shall be carefully gone over with chasing tools and left sharp and clean. the Contracting Officer shall be notified when the model and the finished tablet is ready for inspection. The tablet shall bear lettering as shown on detail and as directed. The tablet shall not be cast until the model has been approved.
  - B. When white nickel bronze tablet is indicated on drawings, it shall be of the following composition:



## 10000 - Specialties

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Copper	52 to 53%
Zinc	20%
Nickel	16%
Tin	4%
Lead	6 to 7%
Impurities	1%

### 2.3 Cast Aluminum Seals Corpus Christi Army Depot:

- A. Seals of the Corpus Christi Army Depot shall be done by carvers skilled and experienced in executing high class work in a correct and artistic manner.
- B. Before any carving is begun, submit the name of the carver to the Contracting Officer for approval together with a record of the carver's experience in executing similar work.
- C. Submit 8" x 10" photographs in triplicate to the Contracting Officer for approval.
- D. Lettering to be included
- E. Seals shall be approved before delivery to the job.
- F. Location and size shall be as directed by the Contracting Officer.

### 2.4 Occupancy Signs:

- A. Frame for occupancy certificate, maximum occupancy and the Contracting Officer signs shall be of aluminum, satin finish, with one side of frame removable.
- B. Size shall be as directed by the Contracting Officer
- C. A plywood backing shall be furnished and installed in the frames.
- D. Frames shall be secured to walls.
- E. Glazing shall be as specified by the Contracting Officer.

### 3.0 EXECUTION:

#### 3.1 Installation:

- A. All parts properly aligned and securely fastened for rigidity.
- B. Clean all surfaces at completion of work.

END OF SECTION 10440d



## SECTION 10440e

### ALUMINUM FLAG SIGNS

- 1.01 DESCRIPTION: This specification covers the furnishing and installation of steel post mounted aluminum flag signs. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.02 REFERENCED DOCUMENTS
- A. Industry Standards
1. American Society for Testing and Materials (ASTM)
    - A36 Steel channels and base plates. Minimum yield strength of 36,000 PSI.
    - A500 Steel tubes. Grade B with minimum yield strength of 46,000 PSI.
    - B209 Aluminum sheet. Alloy and temper 3003-H14.
    - B221 Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes.
    - B308 Aluminum channels, angles, flats, plates, rounds and squares. Alloy and temper 6061-T6.
    - F593 Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs
    - F594 Specification for Stainless Steel Nuts
  2. American Architectural Manufacturers Association (A.A.M.A.): Voluntary specification for high performance organic coatings on architectural extrusions and panels - 605.2.
  3. American Welding Society (AWS):
- D1.1 Structural Welding Code - Steel
- D1.2 Structural Welding Code - Aluminum
4. Steel Structures Painting Council (SSPC): Surface preparation for painting.
- 2.0 PRODUCTS
- 2.01 COATING MANUFACTURERS: Products specified as standard of quality are manufactured by Akzo Coatings Inc., Wyandotte; coatings of Matthews Paint Co.; PPG Industries Inc., or other approved products are acceptable, provided cured coatings are capable of producing a substrate for silkscreening and vinyl die-cut application.
- 2.02 FLAGS WITH RADIUS ENDS
- A. Fabricate flag panel from 1/8 inch thick seamless aluminum sheet rolled to shape as indicated.



## 10000 - Specialties

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- B. Interior framework of sign to be fabricated of continuous aluminum channel using full penetration welds as indicated.
- C. Dimensions shall be within plus or minus 1/16 inch. Deviation from squareness shall not be more than plus or minus 1-1/2 degrees.
- D. Clear-etch and shop-coat aluminum parts as specified after fabrication but before parts have been assembled.
- E. Protect aluminum parts contacting dissimilar metal after assembly from galvanic action by applying bituminous paint or isolation tape to the abutting surface areas.

### 2.03 FLAGS FROM CUT ALUMINUM

- A. Fabricate flag panel from 1/8 inch thick aluminum sheet cut to size as indicated. Ease edges to slight radius to accommodate paint adherence.
- B. Verify location of bolt holes and punch.
- C. Dimensions shall be within plus or minus 1/16 inch. Deviation from squareness shall be less than plus or minus 1-1/2 degrees.
- D. Clear-etch and shop-coat aluminum parts as specified after fabrication but before parts have been assembled.
- E. Protect aluminum parts contacting dissimilar metal after assembly from galvanic action by applying bituminous paint or isolation tape to the abutting surface areas.

- 2.04 POSTS: Fabricate as indicated on Contract Drawings. Finish welds to match approved samples and as specified. Prepare for coating as specified in SSPC-SP10 and SSPC-SP1, and as recommended by coating manufacturer.

### 2.05 GRAPHICS

- A. Graphics shall be as indicated on Contract Drawings.
- B. Art and typography shall be provided at Contractor's expense from Corpus Christi Army Depot designated service bureaus as reproducible film positives. No substitutions of near equals are acceptable.
- C. Enlargement of typography, logotype or symbols shall be done photographically. No hand cut stenciling or hand painting is allowed.
- D. All symbols, messages, and the Corpus Christi Army Depot logotype are to be photosilkscreened onto finished substrates.

### 2.06 PAINT

- A. Prime and paint sign components to meet or exceed A.A.M.A 605.2, and in accordance with coating manufacturer's printed instructions.
- B. Prime all frames, and posts with Wyandotte Grip Gard Wash Primer (2AFY-31284) and Wash Primer Hardener (10 AFK-31285) or acceptable two-part self-etching and passivating metal primer for underlying acrylic urethane enamel. All surfaces shall be degreased. Degreasing may be done with Wyandotte Wax and Grease remover M-600 (10 AHY-31206). Scuff steel.



Scuff aluminum with ScotchBrite 7447. Etching solutions may also be used. Change cleaning and degreasing cloths often.

- C. Paint all elements following specified color scheme with 2 to 3 medium coats of Wyandotte Grip-Gard Acrylic Urethane Enamel or acceptable two-part acrylic urethane enamel, such as Matthews Acrylic Polyurethane by MPC.
  - D. Silkscreen graphics.
  - E. Apply a matte finish clear coat of Grip-Gard Clear 4 hours after application of the silkscreened graphics.
- 2.07 SILKSCREENING: Within 48 hours of final color coat on painted surfaces, silkscreen graphics with K.C. Coatings Enamel Plus. Test for adhesion on sample of finished material, prior to final silkscreening application.
- 2.08 FOUNDATION: Install foundation as shown on Contract Drawings. Foundation shall consist of Class 3000 concrete conforming to PORTLAND CEMENT CONCRETE and reinforced in accordance with CONCRETE REINFORCEMENT.
- 2.09 FASTENERS: All bolts and screws connecting dissimilar metals shall be stainless steel ASTM F593/F594, alloy group 1 or 2, CW ; provide isolating washers separating contact surfaces.
- A. Bolts and nuts: Hex head, coarse thread bolts with nuts, washers, and lockwashers.
  - B. Mounting brackets: Extruded aluminum, ASTM B221 drilled for sign bolts; cut to length, drill, deburr.
- 3.0 EXECUTION
- 3.01 INSPECTION: Verify that surfaces and structures which will receive signs are complete, in alignment, plumb, true, and painted before starting to install signs.
- 3.02 PRELIMINARY WORK: Excavate for foundation in accordance with EARTHWORK. Place concrete formwork, concrete reinforcement, and cast-in-place concrete in accordance with CONCRETE FORMWORK, CONCRETE REINFORCEMENT, and CAST-IN-PLACE CONCRETE, respectively.
- 3.03 INSTALLATION
- A. Install foundation anchor bolts on plywood template; allow template to remain in-place until post has been installed.
  - B. Wrap or otherwise protect paint finish of posts and all components to avoid damage during shipping and installation. Contractor shall be responsible for refinishing or replacing any damaged components to Corpus Christi Army Depot's satisfaction.
  - C. Faces: Install flag sign unit to post as shown. Flag shall be plumb and square to post. Contractor shall shop fit flags to post to assure proper alignment. Protect all components against scratches and other damages.
  - D. Posts: Shop weld base plate to post as shown and install using leveling nuts and washers under plate and lock nuts and washers above. Paint exposed nuts same color as base. Fill void under plate with non-shrinking, non-ferrous grout and finish edge of exposed grout neatly.
  - E. Place aluminum base cap painted grey over base plate.



## 10000 - Specialties

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### 3.04 TOUCH-UP AND CLEANING

- A. Touch-up scratches with coating matching color and texture of original coating.
- B. Clean installed signs, as recommended by paint manufacturer.

3.05 FIELD QUALITY CONTROL: Installed signs will be inspected, four weeks after having been installed, for evidence of discoloring, disintegrating finish, and other manufacturing faults, and for evidence of faulty installation. Replace rejected signs at no additional cost to the Contracting Officer.

END OF SECTION 10440e





## SECTION 10440f

### SHEET ALUMINUM SIGNS

- 1.01 DESCRIPTION: This specification covers the furnishing and installation of cut from sheet aluminum. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.02 REFERENCED DOCUMENTS
- A. Industry Standards
1. American Society for Testing and Materials (ASTM)
    - A36 Base plates; Minimum yield strength of 36,000 psi.
    - A123 Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip
    - A153 Zinc Coating (Hot-Dip) on Iron and Steel Hardware
    - A385 High-Quality Zinc Coatings (Hot-Dip)
    - A386 Zinc Coating (Hot-Dip) on Assembled Steel Products
    - A500 Steel tubes; grade B with minimum yield strength of 46,000 psi.
    - A525 Steel Sheet Zinc-Coated (Galvanized) by the Hot-Dip Process
    - B209 Aluminum sheet. Alloy and temper 6061-T6.
    - B221 Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes.
    - B308 Aluminum channels, angles, flats, plates, rounds and squares. Alloy and temper 6061-T6.
    - F593 Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs
    - F594 Specification for Stainless Steel Nuts
  2. American Architectural Manufacturers Association (A.A.M.A.): Voluntary specification for high performance organic coatings on architectural extrusions and panels - 605.2.
  3. American Welding Society (AWS): D1.1 Structural Welding Code - Steel
  4. Steel Structures Painting Council (SSPC): Surface preparation for painting.
- 2.0 PRODUCTS
- 2.01 COATING MANUFACTURERS: Products specified as standard of quality are manufactured by Akzo Coatings Inc., Wyandotte; coatings of Matthews Paint Co.; PPG Industries Inc., or other approved



## 10000 - Specialties

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products are acceptable, provided cured coatings are capable of producing a substrate for silkscreening and vinyl die-cut application.

### 2.02 SHEET ALUMINUM SIGN FACES

- A. Fabricate sign panel from 1/8 inch aluminum sheet cut to shape and size indicated. Ease edges to slight radius to accommodate paint adherence.
- B. Dimensions shall be within plus or minus 1/16 inch. Deviation from squareness shall be less than plus or minus 1-1/2 degrees.
- C. Clear-etch and shop-coat aluminum parts as specified after parts fabrication but before parts have been assembled.
- D. Protect aluminum parts contacting dissimilar metal after assembly from galvanic action by applying bituminous paint or isolation tape to the abutting surface areas as shown on Contract Drawings.
- E. Verify location and size of all bolt holes prior to punching.

### 2.03 POSTS

- A. Welded, tubular: Fabricate as indicated on Contract Drawings. Finish welds to match accepted samples. Prepare for coating as specified in SSPC-SP10 and SSPC-SP1, and as recommended by coating manufacturer.
- B. U-channel: Hot rolled steel, galvanized after fabrication, primed and painted. Drill posts as detailed on Contract Drawings, touch-up with cold galvanizing compound.

### 2.04 GRAPHICS

- A. Graphics shall be as indicated on Contract Drawings.
- B. Art and typography shall be provided at Contractor's expense from Corpus Christi Army Depot designated service bureaus as reproducible film positives. No substitutions of near equals are acceptable.
- C. Enlargement of typography, logotype or symbols shall be done photographically. No hand cut stenciling or hand painting is permitted.
- D. All color bands in the Corpus Christi Army Depot Signing Logotype shall be painted as specified.
- E. All symbols, messages, and the Corpus Christi Army Depot logotype shall be photosilk-screened onto finished substrates.

### 2.05 REFLECTIVE GRAPHICS: Where specified or indicated, portions or all of sign faces shall have reflective graphics.

- A. Make sign face from cut aluminum as specified.
- B. Apply reflective No. 3650 white Scotchlite by 3M Company to aluminum face in accordance with manufacturer's instructions.
- C. Photosilkscreen graphics to reflective vinyl with transparent inks, matching the specified Corpus Christi Army Depot color.



2.06 ASSEMBLY

- A. Install as indicated on the Contract Drawings.
- B. No exposed fasteners, unless specified, will be accepted.

2.07 PAINT: Non-reflective sign faces

- A. Prime and paint sign components to meet or exceed A.A.M.A 605.2, and in accordance with coating manufacturers' printed instructions.
- B. Prime all frames, and posts with Wyandotte Grip Guard Wash Primer (2AFY-31284) and Wash Primer Hardener (10 AFK-31285) or acceptable two-part self-etching and passivating metal primer for underlying acrylic urethane enamel. All surfaces shall be degreased. Degreasing may be done with Wyandotte Wax and Grease remover M-600 (10 AHY-31206). Scuff steel. Scuff aluminum with ScotchBrite 7447. Etching solutions may also be used. Change cleaning and degreasing cloths often.
- C. Pretreat galvanized posts and other galvanized items by cold phosphate (phosphatizing) process, or prime with etching/ neutralizing primer after degreasing. Coating system shall be composed of products of a single manufacturer.
- D. Paint all elements following specified color scheme with at least two medium coats of Wyandotte Grip-Gard Acrylic Urethane Enamel or acceptable two-part acrylic urethane enamel, such as Matthews Acrylic Polyurethane by MPC.
- E. Silkscreening: Within 48 hours of final color coat on painted surfaces, silkscreen graphics with K.C. Coatings Enamel Plus. After 48 hours scuff sanding is required.
- F. Apply a matte finish clear coat of Grip-Gard Clear 4 hours after application of the silkscreened graphics.
- G. Do not apply vinyl die-cuts for at least 72 hours after clear coat application.

2.08 PAINT: Reflective sign faces.

- A. Spray light coats of translucent colors to match Corpus Christi Army Depot color specifications, using Wyandotte Grip-Flex Plastic Sign Paint. Six to twelve coats are required, with 2 to 3 minutes drying time between coats.
- B. Use Wyandotte Matte Clear as an extender, following manufacturer's specifications.
- C. Transparent silkscreening: Within 48 hours of final color coat on painted surfaces, silkscreen graphics with K.C. (Kansas City) Coatings Plastic Plus Gloss Vinyl Plastic Ink, the PB series (PB is transparent ink). Mix inks to match Corpus Christi Army Depot color specifications.
- D. After silkscreened graphics are applied, finish with Wyandotte Vibrolite Clear Topcoat.

2.09 FASTENERS: All bolts and screws connecting dissimilar metals shall be stainless steel ASTM F593/F594, alloy group 1 or 2, CW ; provide isolating washers separating contact surfaces.

- A. Bolts and nuts: Hex head, coarse thread bolts with nuts, washers, and lockwashers.
- B. Straps: Stainless steel with high carbon strap buckles.



## 10000 - Specialties

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- C. Sign mounting brackets: Extruded aluminum, ASTM B221 machined for straps, drilled for sign bolts; cut to length, drill, deburr and paint Corpus Christi Army Depot grey as specified.

### 3.0 EXECUTION

- 3.01 INSPECTION: Verify that surfaces and structures receiving signs are complete, in alignment, plumb, true, and painted before starting installation.

- 3.02 PRELIMINARY WORK: Field verify all required locations and structures. Include results on all shop drawing submittals.

### 3.03 INSTALLATION

- A. Wrap or otherwise protect paint finish of all components to avoid damage during shipping and installation. Contractor shall be responsible for refinishing or replacing any damaged components to Corpus Christi Army Depot's satisfaction.
- B. Install signs as indicated. Protect all components against scratches and other damages.
- C. Tack weld stainless steel nuts to bolts as indicated on the Contract Drawings.

### 3.04 TOUCH-UP AND CLEANING

- A. Touch-up scratches with coating matching color and texture of original coating.
- B. Clean installed signs, as recommended by paint manufacturer.

- 3.05 FIELD QUALITY CONTROL: Installed signs will be inspected, four weeks after having been installed, for evidence of discoloring, disintegrating finish, and other manufacturing faults, and for evidence of faulty installation. Replace rejected signs at no additional cost to the Contracting Officer.

END OF SECTION 10440f



## SECTION 10440g

### NONILLUMINATED FIBERGLASS SIGNS

- 1.01 DESCRIPTION: This specification covers the furnishing and installation of wall mounted fiberglass signs . Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.02 REFERENCED DOCUMENTS
- A. Industry Standards
1. American Society for Testing and Materials (ASTM)
    - B209 Aluminum-Alloy Sheet and Plate
    - B221 Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes
    - B308 Aluminum-Alloy 6061-T6 Standard Structural Shapes, Rolled or Extruded
    - D635 Rate of Burning and/or Extent of Time of Burning of Self-Supporting Plastics in a Horizontal Position
    - E84 Surface Burning Characteristics of Building Materials
  2. American Welding Society (AWS)
    - D1.1 Structural Welding Code - Steel
    - D1.2 Structural Welding Code - Aluminum
  3. Steel Structures Painting Council (SSPC): SP-2 Hand Tool Cleaning
  4. Underwriters Laboratories, Inc. (UL): 94, Tests for Flammability of Plastic Materials for Parts in Devices and Appliances
  5. American Architectural Manufacturers Association (A.A.M.A.): Voluntary specification for high performance organic coatings on architectural extrusions and panels - 605.2.
  6. Provide signage in accordance with Americans with Disabilities Act (ADA) requirements.
- 1.03 QUALITY CONTROL
- A. Design Criteria
1. Appearance of each sign face shall be uniform.
  2. Appearance shall be uniform from sign face to sign face when compared one to another.
  3. No lay-up patches and spots shall appear on portions of sign face on which typography, arrows, and pictographs appear. No discoloration and variation in uniformity in surfaces of sign face shall be permitted.



## 10000 - Specialties

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4. Exposed parts of welds in frame, connections, accessories or parts, whether in steel, stainless steel or aluminum shall be ground smooth, level with adjacent surfaces and finished ready to receive finishes.

B. Source quality control

1. When gel coat is tested in accordance with ASTM D635, average burning time shall be not longer than five seconds and average extent of burning shall be five millimeters.
2. When fiber reinforced polyester back-up resin is tested in accordance with ASTM E84, burn rate shall be not more than 25.
3. After matte finish clear coating has been applied, the sign face shall be tested on a 60-degree glossimeter; gloss shall register 11 to 19. Characters contrast with their background shall be at least 70 percent.

### 2.0 PRODUCTS

#### 2.01 NONILLUMINATED WALL AND PENDANT-MOUNTED BAND SIGNS

- A. Sign face: Opaque thermosetting polyester resins reinforced with glass fiber strands molded in one piece, with molded side returns and laminate wall not thinner than 1/4 inch. Tensile strength, after curing, shall be not less than 12,000 psi or more than 14,000 psi. Face shall be resistant to degradation and discoloration during exposure to sunlight. Face shall be finished with opaque paint and photosilkscreened graphics.

1. Gel coat: UL 94 VEO.
2. Graphics: Surface photosilkscreened.
3. Insert: Extruded aluminum, ASTM B221 Alloy 6063.

B. Sign cabinet and face attachments

1. Extruded aluminum conforming to ASTM B221, Alloy 6063.
2. Bent sheet, ASTM B209, Alloy 5005-T34.

C. Mounting gasket: Neoprene, 65 Shore hardness.

D. Fasteners: Stainless steel, type 18-8 alloy.

E. Fabrication

1. Sign face
  - a. Layup of face shall have no voids or exposed fibers extending through gel coat at front and back of panel. Finished surface of face shall have no seam lines, mold marks, insert footprints, or other flaws.
  - b. Finish of sign face at molded corners and edge shall have radius of 1/8 inch.
  - c. Finish of sign face at edges between molded face and back of face shall have radius of 1/16 inch.
  - d. Inserts: Continuous.
2. Graphics



## 10000 - Specialties

- a. Typography and pictographs shall be photosilkscreened. Photographically enlarge and reduce typography, and pictographs. Film positives shall be provided at Contractor's expense from Contracting Officer designated service bureaus.
- b. Exact reproductions, in colors specified.
3. Welds: All visible welds, steel, stainless steel or aluminum, shall be ground smooth and level with adjacent surfaces and finished by sanding ready to receive coatings.
4. Sign cabinet
  - a. Channel frame: Continuous with full penetration welds. Grind outside surfaces of joints flush and smooth.
  - b. Dimensions: Within plus or minus 1/16 inch. Deviation from squareness shall be not more than plus or minus 1- 1/2 degrees. Completed sign shall be designed to deflect over sign length less than 1/32 inch per four feet of span.
  - c. Clear-etch, anodize, and shopcoat aluminum parts with zinc chromate primer after fabrication but before assembly.
5. Protect aluminum parts contacting dissimilar metals after assembly. Gasket shall cover entire contact surface of aluminum.
6. Assemble each sign in manufacturing facility; adjust mounting to ensure that profile of each signface will satisfy tolerances. Joint width shall be uniform to within a tolerance of plus or minus 1/32 inch over a five foot span.
7. Painting: In accordance with paint manufacturer's printed instructions, meet or exceed A.A.M.A 605.2.
  - a. Apply one prime and two or three finish coats to exposed and concealed metal surfaces.
  - b. Sign face: One opaque color coat.
  - c. Graphics: One opaque color coat, satin matte finish, photosilkscreened with edges true and hard and free from serrations and smudges.

### F. Paint

1. Coating manufacturers: Products specified as standard of quality are manufactured by Akzo Coatings Inc., Wyandotte; coatings of Matthews Paint Co.; PPG Industries Inc., or other approved products are acceptable, provided cured coatings are capable of producing a substrate for silkscreening and vinyl die-cut application.
2. Primer: Recommended by panel manufacturer and compatible with finish paint. Acceptable manufacturer: Wyandotte Grip Guard Wash Primer (2AFY-31284) and Wash Primer Hardener (10 AFK-31285) or approved equivalent.
3. Finish paint: Catalyzed acrylic-polyurethane enamel; Wyandotte Grip-Gard Acrylic Urethane Enamel or approved equivalent, spray applied.
4. Silkscreening paint: K. C. Coatings, Enamel Plus.
5. Protective coating: Wyandotte Grip-Gard Clear Matte Finish.



## 10000 - Specialties

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### G. Color matches:

1. Pendant mount structure: Wyandotte Grip-Gard, 187 F5 Grey.

2. Primary colors:

Orange: Wyandotte Grip-Gard 110 A4

Yellow: Wyandotte Grip-Gard 120 A6

Blue: Wyandotte Grip-Gard 163 C6

Grey: Wyandotte Grip-Gard 187 F5

Black: Wyandotte Grip-Gard 188 H3

White: Wyandotte Grip-Gard White

3. Secondary colors:

Warning red: Wyandotte Grip-Gard 106 A4

Warning yellow: Wyandotte Grip-Gard 118 A6

Intern. blue: Wyandotte Grip-Gard 165 B6

### H. Fabrication tolerances

1. Flatness and conformance of finished sign face to configuration: Plus or minus 1/32 inch from a straight edge and from profile line per four square feet of surface.

2. Location of inserts in sign face: Plus or minus 1/16 inch from dimensions shown.

3. Diameter of suspended gas bubbles in lay-up: Not more than 1/16 inch.

## 3.0 EXECUTION

3.01 PRELIMINARY WORK: Wrap and protect shop finished signs to prevent damage during shipping and installation.

## 3.02 INSTALLATION

A. Drill wall surfaces for wall mounted signs. Align expansion and toggle bolts with sign cabinet mounting holes.

B. Drill supports for pendant mounted signs in alignment with sign cabinet mounting bolts. Bowed and warped support channels prohibiting a flush cabinet mounting may be cut if cutting is approved by Contracting Officer.

C. Shim sign cabinets level, flush with finish wall surfaces, and drawn tight.

D. Secure sign faces and align with cabinet.

E. Installed sign shall be true, level, and free from warps, dents, and other irregularities.

## 3.03 TOUCH-UP AND CLEANING

A. Touch-up scratches with coating matching color and texture of original coating. Touch-up shall not be discernible from distance of four feet.

B. Clean installed signs.





## 10000 - Specialties

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- 3.04 FIELD QUALITY CONTROL: Installed signs will be inspected, four weeks after having been installed, for evidence of discoloring, disintegrating of finish, and other manufacturing faults, and for evidence of faulty installation. Replace rejected signs at no additional cost to the Contracting Officer.

END OF SECTION 10440g



## 10000 - Specialties

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### SECTION 10440h

#### ILLUMINATED FIBERGLASS SIGNS

- 1.01 DESCRIPTION: This specification covers the furnishing and installation of illuminated pendant, and wall mounted fiberglass signs. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.02 REFERENCED DOCUMENTS:
- A. Industry Standards
1. American Society for Testing and Materials (ASTM)
    - B209 Aluminum and Aluminum-Alloy Sheet and Plate
    - B221 Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes
    - B308 Aluminum-Alloy 6061-T6 Standard Structural Shapes, Rolled or Extruded
    - D635 Rate of Burning and/or Extent of Time of Burning of Self-Supporting Plastics in a Horizontal Position
    - D2240 Rubber Property-Durometer Hardness
    - E84 Surface Burning Characteristics of Building Materials
  2. American Welding Society (AWS)
    - D1.1 Structural Welding Code - Steel
    - D1.2 Structural Welding Code - Aluminum
  3. Steel Structures Painting Council (SSPC): SP-2 Hand Tool Cleaning
  4. Underwriters Laboratories, Inc. (UL)
    - 94 Tests for Flammability of Plastic Materials for Parts in Devices and Appliances
    - 935 Fluorescent Lamp Ballasts
  5. American Architectural Manufacturers Association (A.A.M.A.): Voluntary specification for high performance organic coatings on architectural extrusions and panels - 605.2.
  6. National Electrical Code (NEC): Wiring and grounding requirements.
  7. Provide signage in accordance with Americans with Disabilities Act (ADA) requirements.
- 2.0 PRODUCTS
- 2.01 ILLUMINATED WALL AND PENDANT-MOUNTED BAND SIGNS



- A. Sign face: Translucent, fiberglass molded in one piece, 1/8 inch thick wall with illuminated graphic message.
  - 1. Fiberglass: Translucent thermosetting polyester resins reinforced with glass fiber strands molded in one-piece and with molded side returns not thinner than 1/4 inch. Tensile strength, after curing, shall be not less than 12,000 psi or more than 14,000 psi. Face shall be resistant to degradation and discoloration during exposure to sunlight. Face shall be finished with opaque paint on non-graphic message areas, and translucent paint on graphic message areas.
  - 2. Gel coat: UL 94 VEO.
  - 3. Graphics: Surface photosilkscreened or frisketed.
  - 4. Insert: Extruded aluminum, ASTM B221 Alloy 6063.
- B. Sign cabinet and face attachments: Extruded aluminum conforming to ASTM B221, Alloy 6063.
- C. Wire raceway: 0.040 inch thick sheet aluminum, ASTM B221, Alloy 6063.
- D. Ballasts: With power factor of not less than 90 percent, rapid start type designed for 430 milliampere 270 volt service, UL935 Class P thermally protected type, certified by Electrical Testing Laboratories to conform to Certified Ballast Manufacturers Specifications, "B" sound-rated, and designed for reliable starting and operating at air temperatures of 0 degrees F at 90 percent of nominal line voltage. Acceptable: Universal's "W-590- D" at directional band sign.
- E. Lamps: Fluorescent F40W medium bi-pin type, in lengths indicated.
- F. Lamp holders: Medium bi-pin type retaining lamps without auxiliary devices.
  - 1. Plunger type: Leviton No. 435 or approved equivalent.
  - 2. Surface type: Leviton No. 436 or approved equivalent.
- G. Wiring: Conform to NEC; ground wire shall be green.
- H. Electrical equipment mountings: Aluminum.
- I. Mounting gasket: Solid or sponge neoprene, 65 Shore hardness. Gasket cement shall be compatible with gasket and mounting substrate.
- J. Fasteners: Stainless steel, type 18-8 alloy.
- K. Sealer: General Electric Co.'s Clear Silicone Sealer, Silglaze N.
- L. Fabrication
  - 1. Sign face
    - a. Lay-up of face shall have no voids or exposed fibers extending through gel coat at front and back of panel. Finished surface of face shall have no seam lines, mold marks, insert footprints, or other flaws.
    - b. Finish of sign face at molded corners and edge shall have radius of 1/8 inch.
    - c. Finish of sign face at edges between molded face and back of face shall have radius of 1/16 inch.



## 10000 - Specialties

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- d. Inserts: Continuous.
- 2. Graphics
  - a. Typography and pictographs shall be either photosilkscreened or frisketed. Photographically enlarge and reduce typography, and pictographs. Film positives shall be provided at Contractor's expense from Corpus Christi Army Depot designated service bureaus.
  - b. Exact reproductions, in colors specified.
- 3. Welds: All visible welds, steel, stainless steel or aluminum shall be ground smooth and level with adjacent surfaces and finished by sanding ready to receive additional coatings.
- 4. Sign cabinet
  - a. Channel frame: Continuous with full penetration welds. Grind outside surfaces of joints flush and smooth.
  - b. Dimensions: Within plus or minus 1/16 inch. Deviation from squareness shall be not more than plus or minus 1- 1/2 degrees. Completed sign shall be designed to deflect over sign length less than 1/32 inch per four-foot of span.
  - c. Clear-etch, anodize, and shop coat aluminum parts with zinc chromate primer after fabrication but before assembly.
- 5. Protect aluminum parts, contacting dissimilar metals after assembly. Gasket shall cover entire contact surface of aluminum.
- 6. Assemble each sign in manufacturing facility; adjust mounting to ensure that profile of each signface will satisfy tolerances. Joint width shall be uniform to within a tolerance of plus or minus 1/32 inch over a five-foot span.
- 7. Painting: In accordance with paint manufacturer's printed instructions, meet or exceed A.A.M.A 605.2.
  - a. Apply one prime and two or three finish coats to exposed and concealed metal surfaces.
  - b. Sign face: Two or three opaque color coats.
  - c. Apply a matte finish clear coat directly on translucent messages. After coat has set to appropriate hardness, apply frisket material for typography, arrows, and symbols. Apply a black-out coat over clear coat and frisketed materials. Cover black-out coat with number of color coats to result in a uniform finish. Remove frisket material only after frisketed edges of paint are hard, straight and true to profile. Total paint thickness shall be not more than five mils.

### M. Paint

- 1. Coating manufacturers: Products specified as standard of quality are manufactured by Akzo Coatings Inc., Wyandotte; coatings of Matthews Paint Co.; PPG Industries Inc., or other approved products are acceptable, provided cured coatings are capable of producing a substrate for silkscreening and vinyl die-cut application.



## 10000 - Specialties

2. Primer: Recommended by panel manufacturer and compatible with finish paint. Acceptable manufacturer: Wyandotte Grip Guard Wash Primer (2AFY-31284) and Wash Primer Hardener (10 AFK-31285) or approved equivalent.
  3. Finish paint: Catalyzed acrylic-polyurethane enamel; Wyandotte Grip-Gard Acrylic Urethane Enamel or approved equivalent, spray applied.
  4. Silkscreening paint: K. C. Coatings, Enamel Plus.
  5. Protective coating: Wyandotte Grip-Gard Clear Matte Finish.
  - N. Fabrication tolerances
    1. Flatness and conformance of finished sign face to configuration: Plus or minus 1/32 inch from a straight edge and from profile line per four square feet of surface.
    2. Location of inserts in sign face: Plus or minus 1/16 inch from dimensions shown.
    3. Diameter of suspended gas bubbles in lay-up: Not more than 1/16 inch.
- 3.0 EXECUTION
- 3.01 INSPECTION
- A. Verify that surfaces and structures receiving signs are complete, in alignment, plumb, true, and painted before starting installation. Verify that junction boxes serving signs are wired and ready to be energized.
  - B. Inform Contracting Officer of completion of signs in shop; permit Contracting Officer to inspect signs before preparation for shipping.
- 3.02 PRELIMINARY WORK: Wrap and protect shop finished signs to prevent damage during shipping and installation.
- 3.03 INSTALLATION
- A. Drill wall surfaces for wall mounted signs. Align expansion and toggle bolts with sign cabinet mounting holes.
  - B. Drill supports for pendant mounted signs in alignment with sign cabinet mounting bolts. Bowed and warped support channels prohibiting a flush cabinet mounting may be cut if cutting is approved by Contracting Officer.
  - C. Shim sign cabinets level, flush with finish wall surfaces, and drawn tight.
  - D. Connect sign wiring to existing wiring. Correct defective illumination and relaying or remove defective product and install new product before installing sign face.
  - E. Secure sign faces and align with cabinet.
  - F. Installed sign shall be true, level, and free from warps, dents, and other irregularities.
- 3.04 TOUCH-UP AND CLEANING
- A. Touch-up scratches with coating matching color and texture of original coating. Touch-up shall not be discernible from distance of four feet.



## 10000 - Specialties

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- B. Clean installed signs.

### 3.05 FIELD QUALITY CONTROL

- A. Installed signs will be inspected, four weeks after having been installed, for evidence of discoloring, disintegrating of finish, and other manufacturing faults, and for evidence of faulty installation. Inspect installation for compliance with NEC Article 600.
- B. Energize signs for 24 hours. Flash those signs, capable of being flashed, for 1/2 hour. After successful operation, energize sign continuously for four weeks.
- C. At the end of "burn-in" period, inspect signs for evidence of discoloration, deterioration of finish, manufacturing faults, and faulty installation. Replace rejected signs at no additional cost to the Contracting Officer.

END OF SECTION 10440h



## SECTION 10440i

### ILLUMINATED EMERGENCY EXIT SIGNS IN FIBERGLASS SIGNS

- 1.01 DESCRIPTION: This specification covers the furnishing and installation of illuminated emergency exit signs into the Corpus Christi Army Depot Band signs. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.02 REFERENCED DOCUMENTS
  - A. Industry Standards
    - 1. Standard Building Code: Section 1118-Exit Illumination and Signs
    - 2. NFPA 101 Life Safety Code
    - 3. National Fire Protection Association (NFPA): 70, National Electrical Code
    - 4. Underwriters Laboratories, Inc. (UL): 924, Emergency Lighting and Power Equipment
  - B. Jurisdictional standards: Comply with applicable County and City EXIT sign and emergency system code requirements.
- 2.0 PRODUCTS
- 2.01 EXIT SIGNS
  - A. Purchase and install a UL 924 listed Emergency EXIT sign as indicated on the Contract Drawings. Acceptable: USI-Prescolite #72421.
  - B. Dimensions shall be within plus or minus 1/16 inch. Deviation from squareness shall not exceed plus or minus 1-1/2 degrees.
  - C. Access for wiring and bulb change shall be from the front face of the exit sign.
- 2.02 GRAPHICS: Graphics shall be as indicated and in compliance with UL requirements.
- 2.03 COLOR OF SIGN FACE
  - A. The face of the exit sign shall be white with 6" red A.D.A. conforming letters forming the word "EXIT" with a matte finish, and a directional chevron(s) with a matte finish. Matte finish shall register between 11 to 19 degree gloss on 60 degree glossimeter. Letters shall contrast with their background by at least 70 percent. "EXIT" and chevron(s) to illuminate red. Chevron(s) shall be located to the right or left of the word "EXIT" and cannot be located between the letters of the word "EXIT." Letters and symbols shall have a width-to-height ratio between 3:5 and 1:1 and a stroke-width-to-height ratio between 1:5 and 1:10.
  - B. Sign box unit shall be matte white.
- 3.0 EXECUTION



## 10000 - Specialties

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- 3.01 EXAMINATION: Verify that surfaces and structures receiving signs are complete, in alignment, plumb, true, and painted before starting to install signs.
- 3.02 PRELIMINARY WORK: Field verify all required locations and structures for electrical hook-up into Corpus Christi Army Depot 's emergency power system. Include results on all shop drawing submittals.
- 3.03 INSTALLATION
- A. Wrap or otherwise protect paint finish of all components to avoid damage during shipping and installation. Contractor shall be responsible for refinishing or replacing any damaged components to Corpus Christi Army Depot's satisfaction.
  - B. Install as indicated. Protect all components against scratches and other damages.
  - C. No exposed fasteners, unless specified, will be accepted.
  - D. EXIT sign power is supplied from the emergency system and shall be kept in separate raceway from circuits supplying the other parts of the fiberglass sign.
- 3.04 TOUCH-UP AND CLEANING: Clean installed signs in accordance with manufacturer's printed recommendations and, excepting UL labels and labels required to comply with codes, remove visible labels.
- 3.05 FIELD QUALITY CONTROL: Installed signs will be inspected, four weeks after having been installed, for evidence of discoloring, disintegrating finish, and other manufacturing faults, and for evidence of faulty installation. Replace rejected signs at no additional cost to the Contracting Officer.
- 3.06 TESTING: All test scheduling, test procedures, test conduct, test data recording, and test data submittal shall be as specified by Corpus Christi Army Depot.

END OF SECTION 10440i





## SECTION 10440j

### ALUMINUM HEADERS FOR INTERIOR & EXTERIOR CASES

#### PART 1 - GENERAL

1.01 DESCRIPTION: The work specified in this Section consists of furnishing and installing a breakformed aluminum header for Corpus Christi Army Depot coin parking centers and information cases.

#### 1.02 REFERENCED DOCUMENTS

##### A. Industry Standards

1. American Society for Testing and Materials (ASTM)
  - B209 Aluminum sheet. Alloy and temper 3003-H14.
  - B221 Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes.
  - B308 Aluminum channels, angles, flats, plates, rounds and squares. Alloy and temper 6061-T6.
  - F593 Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs
  - F594 Specification for Stainless Steel Nuts
2. American Architectural Manufacturers Association (A.A.M.A.): Voluntary specification for high performance organic coatings on architectural extrusions and panels - 605.2.
3. American Welding Society (AWS): D1.2 Structural Welding Code - Aluminum
4. Steel Structures Painting Council (SSPC): Surface preparation for painting.

#### 2.0 PRODUCTS

#### 2.01 HEADERS FOR PAY PARKING CENTERS AND MAP/INFORMATION CASES

- A. Fabricate sign panel from minimum 1/8" seamless aluminum sheet laminated to interior frame as shown on Contract Drawings.
- B. Interior framework of sign shall be fabricated of continuous aluminum channel using full penetration welds.
- C. Dimensions shall be within plus or minus 1/16 inch. Deviation from squareness shall be less than plus or minus 1-1/2 degrees.
- D. Clear-etch and shop-coat aluminum parts as specified after fabrication but before parts have been assembled.
- E. Protect aluminum parts contacting dissimilar metal after assembly from galvanic action by applying bituminous paint or isolation tape to the abutting surface areas, as shown on Contract Drawings.



## 10000 - Specialties

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### 2.02 VINYL GRAPHICS MATERIALS

- A. All black vinyl die-cuts specified shall be 3M Scotchal matte Black, 7 year vinyl or other approved 7-year vinyl.
- B. All white vinyl die-cuts specified shall be 3M Scotchal matte White, 7 year vinyl or other approved 7-year vinyl.
- C. Any custom color vinyl to be a matte, 7-year vinyl.

### 2.03 MOUNTING BRACKET

- A. Fabricate mounting bracket from minimum 1/8" aluminum alloy breakformed to shape and dimension verified in field.
- B. Cap ends of mounting channel, weld and finish all joints smooth and paint entire surface of channel.

### 2.04 GRAPHICS GUIDELINES

- A. Graphics shall be as shown on Contract Drawings.
- B. Art and typography shall be provided at Contractors expense from Corpus Christi Army Depot designated bureaus as reproducible film positives. No substitutions of near equals are acceptable.
- C. Enlargement of typography, logotype or symbols shall be done photographically. No hand cut stenciling or hand painting is allowed.
- D. All color bands in the Corpus Christi Army Depot Signing Logotype shall be painted as specified.
- E. All non-vinyl die cut symbols, messages, and the Corpus Christi Army Depot logotype shall be photosilkscreened onto finished substrates.

### 2.05 GRAPHICS ON HEADER AND BRACKET

- A. The logo section of the panel shall be painted and photosilkscreened as follows: Orange, yellow, blue, and white bands painted with Corpus Christi Army Depot logotype photosilkscreened black on the white panel.
- B. The panel background shall be painted white.
- C. All non-vinyl die-cut messages shall be photosilkscreened in color specified.
- D. The mounting bracket shall be painted grey.
- E. All paints shall be high-gloss finish.

### 2.06 COIN BOX STRUCTURE: The steel frame structure and all coin box cabinetry shall be prepared for painting in accordance with SSPC-SP3 and -SP1, and painted.

### 2.07 PAINTS

- A. Coating manufacturers: Products specified as standard of quality are manufactured by Akzo Coatings Inc., Wyandotte; coatings of Matthews Paint Co.; PPG Industries Inc., or other



approved products are acceptable, provided cured coatings are capable of producing a substrate for silkscreening and vinyl die-cut application.

- B. All paints shall be high-gloss finish.
- C. Any exposed hardware shall be painted grey after installation is complete.

### 2.08 PAINTING

- A. Prime and paint sign components to meet or exceed A.A.M.A. 605.2, and in accordance with coating manufacturers' printed instructions.
- B. Prime all frames, and cabinets with Wyandotte Grip Guard Wash Primer (2AFY-31284) and Wash Primer Hardener (10 AFK-31285) or acceptable two-part self-etching and passivating metal primer for underlying acrylic urethane enamel. All surfaces shall be degreased. Degreasing may be done with Wyandotte Wax and Grease remover M-600 (10 AHY-31206). Scuff aluminum with ScotchBrite 7447. Etching solutions may also be used. Change cleaning and degreasing cloths often.
- C. Paint all elements following specified color scheme with 2 to 3 medium coats of Wyandotte Grip-Gard Acrylic Urethane Enamel or acceptable two-part acrylic urethane enamel, such as Matthews Acrylic Polyurethane by MPC.
- D. Silkscreen graphics.
- E. Apply a matte finish clear coat of Grip-Gard Clear 4 hours after application of the silkscreened graphics.

2.09 SILKSCREENING: Within 48 hours of final color coat on painted surfaces, silkscreen graphics with K.C. Coatings Enamel Plus. After 48 hours scuff sanding is required.

2.10 FASTENERS: All bolts and screws connecting dissimilar metals shall be stainless steel ASTM F593/F594, alloy group 1 or 2, CW ; provide isolating washers separating contact surfaces.

- A. Bolts and nuts: Slotted round head, coarse thread bolts with nuts, washers, and lockwashers.

### 3.0 EXECUTION

#### 3.01 ASSEMBLY - VINYL GRAPHICS APPLICATION

- A. Do not apply on newly painted surface for at least 72 hours.
- B. Apply graphics level in position shown on Contract Documents.
- C. Position graphics in place with carrier sheets.
- D. Secure graphics to substrate; in-place graphics shall have full contact with substrate, and contain no trapped air or loose edges.

#### 3.02 HEADER ASSEMBLY

- A. Secure mount channel to top of steel frame using 18-8 stainless steel hardware. Separate dissimilar metals with isolation tape.



## 10000 - Specialties

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- B. Mount sign panel onto mounting channel and attach using countersunk 18-8 stainless steel tamperproof machine screws into Rivnut or similar concealed device. Touch up screw heads and any exposed hardware to conceal.
- 3.03 INSPECTION: Verify that surfaces and structures receiving signs are complete, in alignment, plumb, true, and painted before starting to install signs.
- 3.04 PRELIMINARY WORK: Field verify all dimensions of existing Pay Parking Center units and existing Map/Information cases.
- 3.05 INSTALLATION
  - A. Install as indicated on the Contract Documents.
  - B. Wrap or otherwise protect paint finish of all components to avoid damage during shipping and installation. Contractor shall be responsible for refinishing or replacing any damaged components to Corpus Christi Army Depot's satisfaction.
  - C. Faces: Install headers to units and cases as shown. Headers shall be plumb and square to cases. Protect all components against scratches and other damages.
- 3.06 TOUCH-UP AND CLEANING
  - A. Touch-up scratches with coating matching color and texture of original coating.
  - B. Clean installed signs.
- 3.07 FIELD QUALITY CONTROL: Installed signs will be inspected, four weeks after installation, for evidence of discoloring, disintegrating finish, and other manufacturing faults, and for evidence of faulty installation. Replace rejected signs at no additional cost to the Contracting Officer.

END OF SECTION 10440j



## SECTION 10440k

### ACRYLIC SIGNS

- 1.01 DESCRIPTION: This specification covers the furnishing and installation of acrylic signs. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.02 REFERENCED DOCUMENTS
  - A. Industry Standards: American Society for Testing and Materials (ASTM): E84 Surface Burning Characteristics of Building Materials
- 1.03 QUALITY CONTROL
  - A. Design Criteria
    - 1. Appearance of signs shall be uniform.
    - 2. Appearance shall be uniform from letter to letter when compared one to another at distance of four feet.
    - 3. The sign face shall be tested on a 60 degree glossimeter; gloss shall register 11 to 19. Characters contrast with their background shall be at least 70 percent.
- 2.0 PRODUCTS
- 2.01 MATERIALS AND FINISHES
  - A. Sign face: 1/8 inch thick, optically correct, clear, nonglare, pure virgin acrylic, satin finish without imperfections or scratches; Rohm and Haas, Inc.'s Plexiglas or accepted equivalent. Cut and finish edges straight and smooth, and hand- polish to a transparency equivalent to sign face.
  - B. Back-up sheet: 0.015 inch thick rigid vinyl; permanently adhere back-up sheet to face sheet.
  - C. Room name signs shall have 1/32 inch minimum raised text achieved with applied letters and numbers chemically welded to face material. Room name signs shall also have Braille type grade 2 equivalent to text above. Braille shall be embossed to meet ADA requirements.
  - D. All other acrylic signs, other than room name signs, shall have computer generated photosilkscreened printed graphics, chemically bonded to back surface with background surface subsequently applied.
- 2.02 GRAPHICS: Typography and art shall be as indicated. Photographically enlarge and reduce typography and pictographs. Film positives shall be provided at Contractor's expense from Corpus Christi Army Depot designated service bureaus.
- 2.03 PAINT: In accordance with coating manufacturers' printed instructions.



## 10000 - Specialties

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- A. Silkscreening paints:
  - 1. K. C. Coatings, Enamel Plus.
  - 2. Naz-Dar Plastic/Glass ink 70-000 series.
  - 3. Colonial Max Print series C-33.

### 2.04 MOUNTING MATERIALS

- A. Adhesive: General Electric Co.'s Silicone Rubber Adhesive/Sealant RTV 109, Industrial Grade.
- B. Primer: General Electric Co.'s Silicone Primer SS 4044.
- C. Pressure-sensitive tape: 1/2 inch wide by 1/16 inch thick; Norton Co.'s Normount V-2000.
- D. Magnetic tape: 3/4 wide by thickness capable of securely holding sign in place.
- E. Backing plate: Mill-finish aluminum Alloy 3003.
- F. Fasteners: Flat-head stainless steel wood screws with lead shields.

### 3.0 EXECUTION

3.01 INSPECTION: Inspect surfaces and structures on which signs will be attached before starting work of this Section.

### 3.02 PREPARATION

- A. Finish surfaces concealed by signs before installing signs.
- B. Clean and dry sign mounting surface. Remove loose materials and other contaminants.
- C. Prime backing plate and stainless steel surfaces with sealant primer after cleaning with methyl ethyl ketone. Prime painted metal after cleaning with naphtha.

3.03 INSTALLATION: In accordance with manufacturers' printed instructions. Installed sign shall be secure; sign bottom shall be horizontal.

- A. Install backing plate only on masonry and rough concrete surfaces.
- B. Apply at least two inches of pressure-sensitive tape to back of sign 1/2 inch from edges at corners. Do not remove protective liner until ready to mount sign.
- C. Apply bead of adhesive to back of sign between corner tapes; leave not less than 1/4 inch between tape ends and bead.
- D. Apply adhesive at center of back of sign between adhesive beads.
- E. Verify alignment and height, remove protective cover from tapes, then hand-press sign flat and firmly in-place.
- F. Immediately clean sign and remove excess adhesive from adjacent surfaces.

3.04 CLEANING: Clean installed signs in accordance with manufacturers' recommendations and repair any damage on adjacent surfaces.



## 10000 - Specialties

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3.05 FIELD QUALITY CONTROL: Installed signs will be inspected, four weeks after installation, for evidence of discoloring, disintegration of finish and other manufacturing faults, and for faulty installation. Replace rejected signs at no additional cost to the Contracting Officer.

END OF SECTION 10440k



## 10000 - Specialties

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### SECTION 10440I

#### BRAILLE SIGNS

- 1.01 DESCRIPTION: This specification covers the furnishing and installation of photoetched Braille signs. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.02 REFERENCED DOCUMENTS
- A. Standards of the following as referenced: American National Standards Institute (ANSI).
  - B. Industry standards:
    - 1. Department of Justice, Office of the Attorney General, "Americans with Disabilities Act", Public Law 101-336, (ADA).
    - 2. ANSI A117.1: Providing Accessibility and Useability for Physically Handicap People, 1986 edition.
    - 3. Federal Register Part III, Department of Justice, Office of the Attorney General, 28 CFR Part 36: Nondiscrimination on the Basis of Disability by Public Accommodations and in Commercial Facilities, Final Rule, July 26, 1991.
    - 4. Federal Register Part II, Architectural and Transportation Barriers Compliance Board, 36 CFR Part 1191: Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Amendment to Final Guidelines, September 6, 1991.
- 1.03 DEFINITIONS: Terms
- A. Braille: Grade 2 Braille including 189 part-word or whole word contractions in addition to Grade 1 Braille 63 characters. Tactile is required whenever Braille is required; see SYSTEM DESCRIPTION Article below.
  - B. Tactile: 1/32" raised capital letters, 5/8" high.
- 1.04 QUALITY CONTROL
- A. Work required under this section from manufacturers regularly engaged in work of this magnitude and scope for minimum of five years.
  - B. Finished sign face shall be tested on a 60 degree glossimeter; gloss shall register 11 to 19. Characters contrast with their background shall be at least 70 percent.
- 1.05 HANDLING AND STORING: Handle and store signs in accordance with sign manufacturer's printed instructions.
- 1.06 SEQUENCING AND SCHEDULING: Schedule system installation after related finishes have been completed.





- 1.07 WARRANTY: The work of this Section requires extended three year warranty on all coatings applied under this Contract.
- 2.0 PRODUCTS
- 2.01 MANUFACTURED UNITS: Acceptable product:
  - A. Plaque: APCO; Metal Etch Signs, 388 Grant Street SE, Atlanta, Georgia, 30312, USA. Phone; (404) 688-9000. Fax; (404) 577-3847.
  - B. Other manufacturer's products are acceptable if submitted and are in strict compliance with these specified requirements.
- 2.02 COMPONENTS:
  - A. Plaque:
    - 1. Face:
      - a. Material: Light weight metal alloy.
      - b. Thickness: 1/4 inch.
      - c. ADA tactile signs: Individual 1/32" high letter characters and Braille portion chemically etched into face material.
    - 2. Base:
      - a. Type: Metal alloy, light weight suitable for chemical etch.
      - b. Color: Custom paint colors as indicated on drawings.
    - 3. Corners: 1/2 inch radius corners as indicated.
    - 4. Mounting:
      - a. Surface: Wall or vertical surface.
      - b. Fastening: 3/8 inch diameter stainless steel flat head bolts, countersunk in 1/4 inch thick aluminum back-up sheet which are inserted with silicone adhesive in hole drilled in concrete wall as indicated on drawings.
      - c. Bond metal etched plaque to 1/4 inch aluminum back-up sheet with .010 inch PSA Isotac Adhesive.
      - d. Mounting compound: Dow Corning Corp., 790 Silicone Building Sealant or accepted equivalent.
      - e. Mount sign five feet above finish floor to centerline of sign.
    - 5. Sizes: Eight inches wide by seven inches high.
  - B. Graphics:
    - 1. Type sizes: 5/8 inch high all capital letters
    - 2. Type style:
      - a. Custom style film positives available at Contractor's expense through Corpus Christi Army Depot designated service bureaus.



## 10000 - Specialties

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- b. Exact reproductions in colors specified.
  - 3. Furnish Grade 2 Braille characters for tactile signs; same text as letter designations and symbol translation as indicated.
  - 4. Type codes: All uppercase
- 2.03 FABRICATION: Shop assembly:
  - A. General:
    - 1. Fabricate units to configurations indicated on reviewed shop drawings.
    - 2. Apply copy or graphics to surface of plaque material using computer generated photographic images, chemically etched into photo-sensitized metal.
    - 3. Apply background color after graphics application.
  - B. Furnish required copy indicated on reviewed shop drawings.
  - C. Wrap each individual unit with polyethylene.
- 3.0 EXECUTION
- 3.01 EXAMINATION: Verification of conditions:
  - A. Examine areas to receive signage; notify the Contracting Officer in writing of unacceptable substrate.
  - B. Beginning work indicates acceptance of substrate.
  - C. Subsequent modifications to substrate or signage becomes the contractor's complete responsibility.
- 3.02 INSTALLATION: Install plaques in locations with mounting types indicated on drawings in accord with reviewed shop drawings; square, plumb, and level units. Mount sign five feet above finish floor to centerline of sign.
- 3.03 TOUCH-UP AND CLEANING
  - A. Touch-up scratches with coating matching color and texture of original coating. Touch-up shall not be discernable from distance of four feet.
  - B. Clean installed signs.
- 3.04 FIELD QUALITY CONTROL: Installed signs will be inspected, four week after having been installed, for evidence of faulty installation. Replace rejected signs at no additional cost to the Contracting Officer.

END OF SECTION 10440I



## SECTION 10440m

## DECALS

- 1.01 DESCRIPTION: This specification covers the furnishing and installation of decals. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS
- 2.01 DECALS: 3M Company's Catalog No. 180-120 Satin Aluminum Scotchcal Sheeting with Controltax Adhesive Backing. Size, style, color and spacing of letters, numerals, symbols and borders shall be as shown in the Contract Documents.
- 2.02 GRAPHICS: Photosilkscreened on second surface of decals, unless otherwise specified, in accordance with coating manufacturers printed instructions.
- 2.03 COLOR: Color shall be as indicated; matches, as specified.
- 2.04 COLOR MATCHES
- A. Color matches are as follows:
- |                    |                            |
|--------------------|----------------------------|
| Primary Colors     |                            |
| Orange             | Wyandotte Grip-Gard 110 A4 |
| Yellow             | Wyandotte Grip-Gard 120 A6 |
| Blue               | Wyandotte Grip-Gard 163 C6 |
| Grey               | Wyandotte Grip-Gard 187 F5 |
| Black              | Wyandotte Grip-Gard 188 H3 |
| White              | Wyandotte Grip-Gard White  |
| Secondary Colors   |                            |
| Warning Red        | Wyandotte Grip-Gard 106 A4 |
| Warning Yellow     | Wyandotte Grip-Gard 118 A6 |
| International Blue | Wyandotte Grip-Gard 165 B6 |
- 2.05 EDGE SEALER: 3M Company's 3M Brand Series 4433, or as recommended by decal manufacturer.
- 3.0 EXECUTION
- 3.01 APPLICATION: Clean mounting surface, apply decals, and seal decal edges in accordance with manufacturer's printed application instructions. Clean installed decal face in accordance with manufacturers' recommendations.



## 10000 - Specialties

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- 3.02 FIELD QUALITY CONTROL: Applied decals will be inspected, four weeks after installation, for evidence of discoloring, disintegrating finish, and other manufacturing faults, and for evidence of faulty installation. Replace rejected decals at no additional cost to the Contracting Officer.

END OF SECTION 10440m



## SECTION 10440n

### INDIVIDUAL LETTER SIGNS

- 1.01 DESCRIPTION: The work specified in this Section consists of furnishing and installing individual letter signs as indicated on Contract Drawings.
- 1.02 REFERENCED DOCUMENTS
- A. Industry Standards
1. The Aluminum association, Inc., (AA): 45 Designation System for Aluminum Finishes.
  2. American Society for Testing and Materials (ASTM)  
B209 Aluminum sheet, Alloy 3003-T14.  
B221 Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes.  
B308 Aluminum channels, angles, flats, plates, rounds and squares. Alloy and temper 6061-T6.  
E84 Surface Burning Characteristics of Building Materials  
F593 Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs  
F594 Specification for Stainless Steel Nuts
  3. American Welding Society (AWS): D1.2 Structural Welding Code - Aluminum and D1.2A Commentary on Structural Welding Code, Aluminum
  4. Steel Structures Painting Council (SSPC): Surface preparation for painting.
- 1.03 QUALITY CONTROL
- A. Design Criteria
1. Appearance of each letter shall be uniform.
  2. Appearance shall be uniform from letter to letter when compared one to another at a distance of four feet.
  3. No dark patches and spots shall appear on portions of letter form. No discoloration or variation in uniformity resulting from scratches, abrasions, repairs, and other damage to surface of letters shall be permitted.
- B. Structural criteria
1. Welds on steel and aluminum shall be performed and finished in accordance with AWS Codes.
  2. Signs and fasteners shall be designed to withstand 100 mph wind load, which includes gust factor, without permanent deformation.



## 10000 - Specialties

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### 2.0 PRODUCTS

#### 2.01 MATERIALS AND FINISHES

- A. Material: Aluminum, alloy 6061-T6.
- B. Anodized finish: AA designation - AA M35C11A42 black.
- C. Fasteners: All bolts and screws connecting dissimilar metals shall be stainless steel ASTM F593/F594, alloy group 1 or 2, CW; provide isolating washers separating contact surfaces.
  - 1. Bolts and nuts: Slotted round head, coarse thread bolts with nuts, washers, and lockwashers.
  - 2. Straps: Stainless steel with high carbon strap buckles.
- D. Cut aluminum polished to M32 Satin finish.
- E. Cut aluminum anodized or painted per paint instructions in this specification.
- F. Fabricated aluminum either anodized or painted per specifications.
- G. Cut stainless steel polished to #4 Satin finish.
- H. Cut Muntz metal polished to #4 Satin finish.
- I. Cut aluminum or bronze oxidized and finished with protective coating.
- J. Chrome plated bronze.

#### 2.02 FABRICATION

- A. Letters shall have sharp corners, flat faces, and accurate profiles.
- B. Cut letter faces from 0.25 inch thick material.
- C. Cut sides and shapes from 0.090" thick material; weld joints continuously; grind joint to sharp corner; fill and smooth all seams.
- D. Weld aluminum nuts to back face of letters and shapes.
- E. Sand, degrease, and etch prior to anodizing.
- F. Anodize to color and quality specified; anodized assemblies shall match submitted samples.
- G. Each individual letter shall have a minimum of 3 aluminum nuts except "M" shall have a minimum of 4, welded to back of letter for fastening to wall with stainless steel threaded rods.

#### 2.03 ILLUMINATED AND HALO-LIT LETTERS

- A. Illumination shall be 13mm white neon powered by normal factor transformers installed in building.
- B. Neon tubes and supports will be as required.
- C. Paint inside of letter cabinet and all hardware white.
- D. Electrical outlet on letters shall be maintained in a straight line for easy connection by electrical contractor.



- E. Power to junction box shall be a 110 volt separate circuit.
- F. All connections shall be made by an approved electrical contractor and UL seal shall be placed on return edge of one letter in a non-prominent location.
- G. Conceal countersunk retaining screws on sides and tops of letters.

### 2.04 GRAPHICS

- A. Typography, and art shall be as indicated. Photographically enlarge and reduce typography, and pictographs. Film positives shall be provided at Contractor's expense from Corpus Christi Army Depot designated service bureaus.
- B. Fabrication tolerances
  - 1. Flatness and conformance of finished letter face to configuration: Plus or minus 1/32 inch from a straight edge and from profile line per square foot of surface.
  - 2. Location of inserts in letters: Plus or minus 1/16 inch from dimensions shown.

### 2.05 MOUNTING COMPOUNDS: Cementitious or resinous non-shrink, rapid setting materials of letter manufacturer's choice. Set compound shall be able to securely support letter in place regardless of thermal or moisture impact.

### 2.06 COLOR

- A. Any color proposed other than Black, Grey or White to be submitted to Corpus Christi Army Depot prior to fabrication.
- B. Any exposed hardware used shall be painted to match fascia after installation is complete.

### 2.07 COATING MANUFACTURERS: Products specified as standard of quality are manufactured by Akzo Coatings Inc., Wyandotte; coatings of Matthews Paint Co.; PPG Industries Inc., or other approved products are acceptable, provided cured coatings are capable of producing a substrate for silkscreening and vinyl die-cut application.

### 2.10 PAINTING (if applicable)

- A. Prime and paint sign components to meet or exceed A.A.M.A 605.2, and in accordance with coating manufacturers' printed instructions.
- B. Prime all components with Wyandotte Grip Guard Wash Primer (2AFY-31284) and Wash Primer Hardener (10 AFK-31285) or acceptable two-part self-etching and passivating metal primer for underlying acrylic urethane enamel. All surfaces shall be degreased. Degreasing may be done with Wyandotte Wax and Grease remover M-600 (10 AHY-31206). Scuff aluminum with ScotchBrite 7447. Etching solutions may also be used. Change cleaning and degreasing cloths often.
- C. Paint all elements following specified color scheme with 2 to 3 medium coats of Wyandotte Grip-Gard Acrylic Urethane Enamel or any comparable two-part acrylic urethane enamel, such as Matthews Acrylic Polyurethane by MPC.
- D. Apply a clear coat of Grip-Gard Clear 4 hours after application of the final coat.
- E. Prepare all ferrous metal surfaces for painting in accordance with SSPC-SP3 and -SP1.



## 10000 - Specialties

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### 3.0 EXECUTION

#### 3.01 INSPECTION

- A. Verify that surfaces and structures receiving letters are complete, in alignment, plumb, true, and finished before starting installation.
- B. Inform Contracting Officer of completion of letters in shop; permit Contracting Officer to inspect before preparation for shipping.

#### 3.02 PRELIMINARY WORK: Wrap and protect shop finished letters to prevent damage during shipping and installation.

#### 3.03 INSTALLATION

- A. Drill surfaces for letter mounting studs using full size template. Maintain all approved layout dimensions.
- B. Set letters in place with approved setting compounds; secure individual items until compound sets.
- C. Installed letters shall be true, level, and free from perceptible irregularities and deviations.

#### 3.04 CLEANING: Clean installed letters in accordance with finish manufacturers recommendations.

#### 3.05 FIELD QUALITY CONTROL: Installed letters will be inspected, four weeks after installation, for evidence of discoloring, disintegrating of finish, and other manufacturing faults, and for evidence of faulty installation. Replace rejected letters at no additional cost to the Contracting Officer.

END OF SECTION10440n





## SECTION 10440o

### ORIGINAL FIBERGLASS PYLON RETROFIT

- 1.01 DESCRIPTION: The work specified in this Section consists of finishing the existing Corpus Christi Army Depot pylons with vinyl die cuts and paint.
- 1.02 QUALITY CONTROL
  - A. Design criteria
    - 1. Appearance of each sign face shall be uniform.
    - 2. Appearance shall be uniform from sign face to sign face when compared to one another.
    - 3. No dark patches and spots, resulting from inclusions and undissolved chemicals in lay-up or repairs, shall appear on sign face. No discoloration or variation in uniformity resulting from scratches, abrasions, and other damage to surface of signs shall be permitted.
    - 4. After matte finish clear coating has been applied, the sign face shall be tested on a 60-degree glossimeter; gloss shall register 11 to 19. Characters contrast with their background shall be at least 70 percent.
  - B. Source quality control: the Contracting Officer reserves the right to inspect shop prepared parts prior to shipping.
- 2.0 PRODUCTS
- 2.01 ORIGINAL PYLON RETROFIT
  - A. GRAPHICS MATERIALS
    - 1. The Corpus Christi Army Depot Logotype shall be die cut from 3M Scotchcal matte Black 7 year vinyl or other approved 7-year vinyl.
    - 2. The Transit Station name message, and the Transit Symbols shall be die cut from 3M Scotchcal matte White 7 year vinyl, or other approved 7-year vinyl.
    - 3. Carrier sheets for all die cuts are required.
- 2.02 GRAPHICS GUIDELINES
  - A. Graphics shall be as shown on Contract Documents and approved shop drawings.
  - B. Art and typography shall be purchased by Contractor through Corpus Christi Army Depot designated service bureaus as reproducible film positives. No substitutions of near equals are acceptable.
  - C. Enlargement of typography, logotype or symbols shall be done photomechanically. No hand cut stenciling or hand painting is allowed.



## 10000 - Specialties

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- D. All color bands in the Corpus Christi Army Depot Signing Logotype configuration shall be painted as specified.
- E. All symbols, messages, and the Corpus Christi Army Depot logotype shall be vinyl die cuts.

### 2.03 PAINT

- A. Coating manufacturers: Products specified as standard of quality are manufactured by Akzo Coatings Inc., Wyandotte; coatings of Matthews Paint Co.; PPG Industries Inc., or other approved products are acceptable, provided cured coatings are capable of producing a substrate for silkscreening and vinyl die-cut application.
- B. All paints shall be high-gloss finish.
- C. Any exposed hardware shall be painted grey after installation is complete.

### 3.0 EXECUTION

3.01 EXAMINATION: Verify that surfaces of pylons and appurtenances are sound and capable of retrofitting; check fastenings for corrosion.

### 3.02 PRELIMINARY WORK: Pylon body structure

- A. Use solvents to remove existing vinyl die cuts; test compatibility of solvent on small area, before application on the whole unit.
- B. Existing pylon shall be cleaned using soap & water to remove dirt, grime and any residue from solvents.
- C. Sand entire surface of fiberglass cladding with #120 grit sandpaper. Any cracks, pits, dents or other surface blemishes shall be repaired with compatible body filler and sanded smooth.
- D. Pylon shall be painted using professional paint spray equipment. Tape off separate areas of color and spray using Wyandotte Grip-Gard Acrylic Urethane Enamel. Apply two medium coats.
- E. Apply Wyandotte Grip-Gard Clear, matte finish, 4 hours after application of final coat.

### 3.03 PAINTING

- A. Prime and paint sign components to meet or exceed A.A.M.A. 605.2, and in accordance with coating manufacturers' printed instructions.
- B. Paint all elements following specified color scheme with 2 to 3 medium coats of Wyandotte Grip-Gard Acrylic Urethane Enamel or other approved two-part acrylic urethane enamel, such as Matthews Acrylic Polyurethane by MPC.
- C. Apply a matte finish clear coat of Grip-Gard Clear 4 hours after application of the final coat.

### 3.04 ASSEMBLY - VINYL GRAPHICS APPLICATION

- A. Do not apply vinyl die cuts to the newly painted pylon surface for at least 72 hours.
- B. Apply graphics level to both sides of pylon in position shown on the approved shop drawings.
- C. Position graphics in place and secure carrier sheets to pylon with masking tape across top or one end.



- D. Transfer the graphics to the pylon surface; press firmly.
- E. After all graphics have been transferred, remove the application tape.
- F. Puncture any air bubbles carefully and resqueegee to provide flush contact for all elements.

3.05 TOUCH-UP AND CLEANING

- A. Touch-up scratches with matching coating, in composition, color and texture of original coating.
- B. Clean pylon faces in accordance with paint manufacturer's recommendations.

3.06 FIELD QUALITY CONTROL: Installed pylons will be inspected, four weeks after completion, for evidence of discoloring, disintegrating finish, and other manufacturing faults, and for evidence of faulty installation. Rejected Work shall be repaired or reworked to satisfaction and at no additional cost to the Contracting Officer.

END OF SECTION 10440o



## 10000 - Specialties

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### SECTION 10440p

#### ORIGINAL FIBERGLASS PYLON RETROFIT

- 1.01 DESCRIPTION: This specification covers the furnishing and installation of pylons with vinyl die cuts and paint. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.02 QUALITY CONTROL
  - A. Design criteria
    - 1. Appearance of each sign face shall be uniform.
    - 2. Appearance shall be uniform from sign face to sign face when compared to one another.
    - 3. No dark patches and spots, resulting from inclusions and undissolved chemicals in lay-up or repairs, shall appear on sign face. No discoloration or variation in uniformity resulting from scratches, abrasions, and other damage to surface of signs shall be permitted.
    - 4. After matte finish clear coating has been applied, the sign face shall be tested on a 60-degree glossimeter; gloss shall register 11 to 19. Characters contrast with their background shall be at least 70 percent.
  - B. Source quality control: the Contracting Officer reserves the right to inspect shop prepared parts prior to shipping.
- 2.0 PRODUCTS
- 2.01 ORIGINAL PYLON RETROFIT
  - A. GRAPHICS MATERIALS
    - 1. The Corpus Christi Army Depot Logotype L1 shall be die cut from 3M Scotchcal matte Black 7 year vinyl or other approved 7-year vinyl.
    - 2. The Transit Station name message, and the Transit Symbols shall be die cut from 3M Scotchcal matte White 7 year vinyl, or other approved 7-year vinyl.
    - 3. Carrier sheets for all die cuts are required.
- 2.02 GRAPHICS GUIDELINES
  - A. Graphics shall be as shown on Contract Documents and approved shop drawings.
  - B. Art and typography shall be purchased by Contractor through Corpus Christi Army Depot designated service bureaus as reproducible film positives. No substitutions of near equals are acceptable.
  - C. Enlargement of typography, logotype or symbols shall be done photomechanically. No hand cut stenciling or hand painting is allowed.



- D. All color bands in the Corpus Christi Army Depot Signing Logotype configuration shall be painted as specified.
- E. All symbols, messages, and the Corpus Christi Army Depot logotype shall be vinyl die cuts.

### 2.03 PAINT

- A. Coating manufacturers: Products specified as standard of quality are manufactured by Akzo Coatings Inc., Wyandotte; coatings of Matthews Paint Co.; PPG Industries Inc., or other approved products are acceptable, provided cured coatings are capable of producing a substrate for silkscreening and vinyl die-cut application.
- B. All paints shall be high-gloss finish.
- C. Any exposed hardware shall be painted grey after installation is complete.

### 2.04 COLOR MATCHES

- A. Color matches are as follows:

#### Primary Colors

Orange:	Wyandotte Grip-Gard 110 A4
Yellow:	Wyandotte Grip-Gard 120 A6
Blue:	Wyandotte Grip-Gard 163 C6
Grey:	Wyandotte Grip-Gard 187 F5
Black:	Wyandotte Grip-Gard 188 H3
White:	Wyandotte Grip-Gard White

#### Secondary Colors

Warning Red:	Wyandotte Grip-Gard 106 A4
Warning Yellow:	Wyandotte Grip-Gard 118 A6
International Blue:	Wyandotte Grip-Gard 165 B6

### 3.0 EXECUTION

- 3.01 EXAMINATION: Verify that surfaces of pylons and appurtenances are sound and capable of retrofitting; check fastenings for corrosion.

### 3.02 PRELIMINARY WORK: Pylon body structure

- A. Use solvents to remove existing vinyl die cuts; test compatibility of solvent on small area, before application on the whole unit.
- B. Existing pylon shall be cleaned using soap & water to remove dirt, grime and any residue from solvents.
- C. Sand entire surface of fiberglass cladding with #120 grit sandpaper. Any cracks, pits, dents or other surface blemishes shall be repaired with compatible body filler and sanded smooth.



## 10000 - Specialties

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- D. Pylon shall be painted using professional paint spray equipment. Tape off separate areas of color and spray using Wyandotte Grip-Gard Acrylic Urethane Enamel. Apply two medium coats.
- E. Apply Wyandotte Grip-Gard Clear, matte finish, 4 hours after application of final coat.

### 3.03 PAINTING

- A. Prime and paint sign components to meet or exceed A.A.M.A. 605.2, and in accordance with coating manufacturers' printed instructions.
- B. Paint all elements following specified color scheme with 2 to 3 medium coats of Wyandotte Grip-Gard Acrylic Urethane Enamel or other approved two-part acrylic urethane enamel, such as Matthews Acrylic Polyurethane by MPC.
- C. Apply a matte finish clear coat of Grip-Gard Clear 4 hours after application of the final coat.

### 3.04 ASSEMBLY - VINYL GRAPHICS APPLICATION

- A. Do not apply vinyl die cuts to the newly painted pylon surface for at least 72 hours.
- B. Apply graphics level to both sides of pylon in position shown on the approved shop drawings.
- C. Position graphics in place and secure carrier sheets to pylon with masking tape across top or one end.
- D. Transfer the graphics to the pylon surface; press firmly.
- E. After all graphics have been transferred, remove the application tape.
- F. Puncture any air bubbles carefully and resqueegee to provide flush contact for all elements.

### 3.05 TOUCH-UP AND CLEANING

- A. Touch-up scratches with matching coating, in composition, color and texture of original coating.
- B. Clean pylon faces in accordance with paint manufacturer's recommendations.

- 3.06 FIELD QUALITY CONTROL: Installed pylons will be inspected, four weeks after completion, for evidence of discoloring, disintegrating finish, and other manufacturing faults, and for evidence of faulty installation. Rejected Work shall be repaired or reworked to satisfaction and at no additional cost to the Contracting Officer.

END OF SECTION 10440o



## SECTION 10440q

### PLATFORM STRIP SIGNS

- 1.01 DESCRIPTION: This specification covers the furnishing and installation of die-cut graphics on painted steel channels or steel tubes. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.02 REFERENCED DOCUMENTS
- A. Industry Standards
1. American Society for Testing and Materials (ASTM)
    - A36 Steel channels and base plates. Minimum yield strength of 36,000 PSI.
    - A500 Steel tubes. Grade B with minimum yield strength of 46,000 PSI.
    - F593 Standard Specification for Stainless Steel Bolt, Hex Cap Screws, and Studs
    - F594 Specification for Stainless Steel Nuts
  2. American Architectural Manufacturers Association (A.A.M.A.): Voluntary specification for high performance organic coatings on architectural extrusions and panels - 605.2.
  3. American Welding Society (AWS):
    - D1.1 Structural Welding Code - Steel
    - D1.2 Structural Welding Code - Aluminum
  4. Steel Structures Painting Council (SSPC): Surface preparation for painting.
  5. Provide signage in accordance with Americans with Disabilities Act (ADA) requirements.
- 1.03 QUALITY CONTROL
- A. Design Criteria
1. Appearance of each strip sign face and vinyl die-cut graphics shall be uniform.
  2. Appearance shall be uniform from sign face to sign face when compared to one another at a distance of four feet.
  3. No dark patches and spots shall appear on portions of sign face. No discolorations or variation in uniformity resulting from scratches, abrasions, repairs, and other damage to surface of signs shall be permitted.
  4. After matte finish clear coating has been applied, the sign face shall be tested on a 60 degree glossimeter; gloss shall register 11 to 19. Characters contrast with their background shall be at least 70 percent.



## 10000 - Specialties

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5. No snags, tears, or unresolved corners are acceptable.

### 2.0 PRODUCT

- 2.01 COATING MANUFACTURERS: Products specified as standard of quality are manufactured by Akzo Coatings Inc., Wyandotte; coatings of Matthews Paint Co.; PPG Industries Inc., or other approved products are acceptable, provided cured coatings are capable of producing a substrate for silkscreening and vinyl die-cut application.

### 2.02 GRAPHICS

- A. Graphics shall be as indicated on Contract Drawings.
- B. Art and typography shall be provided at Contractor's expense from Corpus Christi Army Depot designated service bureaus as reproducible film positives. No substitutions of near equals are acceptable.
- C. Enlargement of typography shall be done photographically. No hand cut stenciling or hand painting is allowed.

### 2.03 COLOR

- A. Strip sign face
  1. Paint all exposed faces of steel channel or steel tube blue or orange.
    - a. East/West Line - Blue
    - b. North/South Line - Orange
  2. All paints shall be high-gloss finish.

- 2.04 COLOR MATCHES are as follows: Blue; Wyandotte Grip-Gard 163 C6 (for East/West Line) Orange; Wyandotte Grip-Gard 110-A4 (for North/South Line)

- 2.05 VINYL GRAPHICS MATERIALS: All white vinyl die-cuts specified to be cut from 3M Scotchcal matte White 7-year vinyl or other approved 7-year vinyl.

- 2.06 FASTENERS: All nuts, bolts, washers, etc. shall be Type 304, stainless steel.

### 2.07 SHOP FABRICATION

- A. Paint sign components to meet or exceed A.A.M.A 605.2, and in accordance with coating manufacturer's printed instructions.
- B. Wash steel channel faces with detergent and rinse with clean water. Degrease all surfaces with Wyandotte Wax and Grease remover M-600 (10 AHY-31206). Change cleaning and degreasing cloths often; prime with Grip-Gard wash primer.
- C. Paint all elements following specified color scheme with at least two medium coats of Wyandotte Grip-Gard Acrylic Urethane Enamel or acceptable two-part acrylic urethane enamel, such as Matthews Acrylic Polyurethane by MPC.
- D. Wrap, mask or otherwise protect paint finish of substrates to avoid damage during die cut installation. Contractor shall be responsible for refinishing or replacing any damaged components to Corpus Christi Army Depot's satisfaction.





- E. Permit painted surfaces to cure for at least 72 hours prior to die cut application.
- F. Apply graphics level in position shown on Contract Documents.
- G. Position graphics in place with carrier sheets. Apply vinyl die-cut graphics not sooner than 72 hours after last pigmented paint coat application.
- H. Secure graphics to substrate; in-place graphics shall have full contact with substrate, and contain no trapped air or loose edges.
- I. Apply a matte finish clear coat of Grip-Gard Clear after application of the vinyl die-cut graphics. Permit coating to cure.
- J. Protective wrap signs and rack for transport.

3.0 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's printed instructions and as indicated in the Contract Documents. Install and secure fasteners.
- B. Remove protective wrapping and retouch surfaces if necessary. Pick up all construction debris.

3.02 FIELD QUALITY CONTROL: Installed die cuts and painted surfaces will be inspected, four weeks after installation, for evidence of discoloring, disintegrating finish, and other manufacturing faults, and for evidence of faulty installation. Replace rejected die cuts and other defects at no additional cost to the Contracting Officer.

END OF SECTION 10440q



## 10000 - Specialties

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### SECTION 10440r

#### SILKSCREENED GRAPHICS

- 1.01 DESCRIPTION: This specification covers the furnishing and installation of silkscreened graphic messages. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.02 QUALITY CONTROL
- A. Design Criteria
1. Appearance of each message face shall be uniform.
  2. Appearance shall be uniform from message to message when compared to one another from distance of four feet.
  3. No dark patches and spots, such as those resulting from artifacts and undissolved chemicals in application, shall appear on portions of the silkscreened message. No discoloration or variation in uniformity resulting from scratches, abrasions, and other damage to surface of signs shall be permitted.
  4. After matte finish clear coating has been applied, the sign face shall be tested on a 60-degree glossimeter; gloss shall register 11 to 19. Characters contrast with their background shall be at least 70 percent.
- 2.0 PRODUCTS
- 2.01 SILKSCREENED GRAPHICS: Graphics shall be photosilkscreened on specified substrate using specified ink, and in accordance with coating manufacturers' printed instructions. Application surface shall be clean and dry in accordance with the ink manufacturer's specifications.
- 2.02 GRAPHICS GUIDELINES
- A. Graphics shall be as shown on Contract Documents.
- B. Art and typography shall be provided at Contractor's expense from Corpus Christi Army Depot designated service bureaus as reproducible film positives. No substitutions or near equals are acceptable.
- C. Enlargement of typography, logotype or symbols shall be done photomechanically.
- D. All silkscreening shall be done photographically. No hand cut stenciling or hand painting is permitted.
- E. All color shall be matched as specified.
- 2.03 PAINTS



## 10000 - Specialties

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- A. Coating manufacturers: Products specified as standard of quality are manufactured by Akzo Coatings Inc., Wyandotte; coatings of Matthews Paint Co.; PPG Industries Inc., or other approved products are acceptable, provided cured coatings are capable of producing a substrate for silkscreening and vinyl die-cut application.
- B. All paints shall be high-gloss finish unless otherwise noted on the Contract Documents.
- C. Apply a matte finish clear coat of Grip-Gard clear after application of paint and/or silkscreening as recommended by coating manufacturer's printed instructions.

### 3.0 EXECUTION

3.01 PRELIMINARY WORK: Field verify all dimensions and surface conditions of locations indicated to receive silkscreened graphics.

### 3.02 INSTALLATION

- A. Install as specified or indicated on Contract Drawings.
- B. Wrap, mask or otherwise protect paint finish of existing components to avoid damage during silkscreening. Contractor shall be responsible for refinishing or replacing any damaged components to Corpus Christi Army Depot's satisfaction.

3.03 FIELD QUALITY CONTROL: Installed messages will be inspected, four weeks after installation, for evidence of discoloring, disintegrating finish, and other manufacturing faults, and for evidence of faulty fabrication. Replace rejected work at no additional cost to the Contracting Officer.

END OF SECTION 10440r



## 10000 - Specialties

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### SECTION 10440s

#### BREAKFORMED ALUMINUM TUBES

- 1.01 DESCRIPTION: This specification covers the furnishing and installation of breakformed aluminum tubes. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.02 REFERENCED DOCUMENTS
- A. Industry Standards
1. American Society for Testing and Materials (ASTM)  
B209 Aluminum sheet. Alloy and temper 3003-T14.  
B221 Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes.  
B308 Aluminum channels, angles, flats, plates, rounds and squares. Alloy and temper 6061-T6.  
F593 Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs  
F594 Specification for Stainless Steel Nuts
  2. American Welding Society (AWS): D1.2 Structural Welding Code - Aluminum and D1.2A Commentary on Structural Welding Code, Aluminum
  3. Steel Structures Painting Council (SSPC): Surface preparation for painting.
  4. Provide signage in accordance with Americans with Disabilities Act (ADA) requirements.
- 1.03 QUALITY CONTROL
- A. Design Criteria
1. Appearance of each sign face shall be uniform.
  2. Appearance shall be uniform from sign face to sign face when compared to one another.
  3. Dimensions shall be within plus or minus 1/16 inch. Deviation from squareness shall be less than 1-1/2 degrees.
  4. After matte finish clear coating has been applied, the sign face shall be tested on a 60-degree glossimeter; gloss shall register 11 to 19. Characters contrast with their background shall be at least 70 percent.
- B. Source quality control: the Contracting Officer reserves the right to inspect shop prepared parts prior to shipping.



- C. Structural Criteria: Welds on aluminum shall be performed and finished in accordance with AWS Codes.

### 2.0 PRODUCTS

#### 2.01 Corpus Christi Army Depot BAND INFORMATION TUBE

- A. Fabricate tube from 1/8" seamless aluminum sheet breakformed as shown on the Contract Documents. Cap ends and weld seam continuously; grind and finish to form an eased 90 degree corner.
- B. Dimensions shall be within plus or minus 1/16 inch. Deviation from flatness or squareness shall not be more than plus or minus 1-1/2 degrees.
- C. Clear-etch and shop-coat aluminum parts as specified for this sign type after parts have been fabricated but before parts have been assembled.
- D. Protect aluminum parts contacting dissimilar metal after assembly from galvanic action by applying bituminous paint or isolation tape to the abutting surface areas, as shown on Contract Drawings.
- E. Graphics shall be photosilkscreened letters.
- F. Apply a matte finish clear coat of Grip-Gard Clear 4 hours after application of silkscreened graphics.

#### 2.02 SILKSCREENING: Within 48 hours of final color coat on painted surfaces, silkscreen graphics with K.C. Coatings Enamel Plus.

#### 2.03 GRAPHICS GUIDELINES

- A. Graphics shall be as shown on Contract Documents.
- B. Art and typography shall be purchased by the Contractor thru Corpus Christi Army Depot designated service bureaus as reproducible film positives. No substitutions or near equals are acceptable.
- C. Enlargement of typography, logotype or symbols shall be done photographically. No hand cut stenciling or hand painting is allowed.

#### 2.04 PAINT

- A. Coating manufacturers: Products specified as standard of quality are manufactured by Akzo Coatings Inc., Wyandotte; coatings of Matthews Paint Co.; PPG Industries Inc., or other approved products are acceptable, provided cured coatings are capable of producing a substrate for silkscreening and vinyl die-cut application.
- B. All paints shall be high-gloss finish.
- C. Any exposed hardware shall be painted grey after installation is complete.

#### 2.05 COLOR MATCHES

- A. Color matches are as follows:
  - Primary Colors



## 10000 - Specialties

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Orange: Wyandotte Grip-Gard 110 A4

Yellow: Wyandotte Grip-Gard 120 A6

Blue: Wyandotte Grip-Gard 163 C6

Grey: Wyandotte Grip-Gard 187 F5

Black: Wyandotte Grip-Gard 188 H3

White: Wyandotte Grip-Gard White

### Secondary Colors

Warning Red: Wyandotte Grip-Gard 106 A4

Warning Yellow: Wyandotte Grip-Gard 118 A6

International Blue: Wyandotte Grip-Gard 165 B6

2.06 FASTENERS: All bolts and screws connecting dissimilar metals shall be stainless steel ASTM F593/F594, alloy group 1 or 2, CW ; provide isolating washers separating contact surfaces.

A. Bolts and nuts: Slotted round or hex head, coarse thread bolts with nuts, washers, and lockwashers.

### 3.0 EXECUTION

3.01 INSPECTION: Verify that surfaces and structures receiving signs are complete, in alignment, plumb, true, and finished before starting to install signs.

3.02 PRELIMINARY WORK: Field verify all dimensions of existing Corpus Christi Army Depot Bands and include on shop drawings.

### 3.03 PAINTING

A. Prime and paint sign components to meet or exceed A.A.M.A. 605.2, and in accordance with coating manufacturers' printed instructions.

B. Prime all components with Wyandotte Grip Guard Wash Primer (2AFY-31284) and Wash Primer Hardener (10 AFK-31285) or any comparable two-part self-etching and passivating metal primer for underlying acrylic urethane enamel. All surfaces must be degreased. Degreasing may be done with Wyandotte Wax and Grease remover M-600 (10 AHY-31206). Scuff aluminum with ScotchBrite 7447 or use etching solutions. Change cleaning and degreasing cloths often.

C. Paint all elements following specified color scheme with 2 to 3 medium coats of Wyandotte Grip-Gard Acrylic Urethane Enamel or other approved two-part acrylic urethane enamel, such as Matthews Acrylic Polyurethane by MPC.

D. Silkscreen graphics.

E. Apply a matte finish clear coat of Grip-Gard Clear 4 hours after application of the silkscreened graphics.

### 3.04 INSTALLATION

A. Install as specified and indicated.



## 10000 - Specialties

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- B. Wrap or otherwise protect paint finish of all components to avoid damage during shipping and installation. Contractor shall be responsible for refinishing or replacing any damaged components to Corpus Christi Army Depot's satisfaction.
- C. Install tubes to Corpus Christi Army Depot Bands as shown on approved shop drawings. Tubes shall be plumb and square to Bands. Protect all components against damage.

### 3.05 TOUCH-UP AND CLEANING

- A. Touch-up scratches with coating matching color and texture of original coating.
- B. Clean installed signs in accordance with paint manufacturers recommendations.

### 3.06 FIELD QUALITY CONTROL: Installed signs will be inspected, four weeks after having been installed, for evidence of discoloring, disintegrating finish, and other manufacturing faults, and for evidence of faulty installation. Rejected Work shall be repaired or reworked at no additional cost to the Contracting Officer.

END OF SECTION 10440s



## 10000 - Specialties

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### SECTION 10440t

#### VINYL DIE CUT GRAPHICS

- 1.01 DESCRIPTION: This specification covers the furnishing and installation of vinyl die cut signs. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.02 QUALITY CONTROL
- A. Design Criteria
1. Appearance of each die cut shall be uniform.
  2. Appearance shall be uniform from graphic form to graphic form compared to one another at a distance of four feet.
  3. No snags, tears, or unresolved corners are acceptable.
  4. After matte finish clear coating has been applied, the sign face shall be tested on a 60 degree glossimeter; gloss shall register 11 to 19. Characters contrast with their background shall be at least 70 percent.
- 2.0 PRODUCTS
- 2.01 VINYL GRAPHICS MATERIALS
- A. All black vinyl die cuts specified to be 3M Scotchcal Matte Black 7 year vinyl or other approved 7-year vinyl.
- B. All white vinyl die-cuts specified to be cut from 3M Scotchcal Matte White 7-year vinyl or other approved 7-year vinyl.
- C. Any custom color vinyl to be 3M Scotchcal Matte, 7-year vinyl or other approved 7-year vinyl.
- 2.02 COLOR: Color to be as indicated in Contract Drawings.
- 2.03 SILKSCREENING: Use proper vinyl silkscreen ink for any custom color solids and all silkscreened graphics on vinyl.
- 3.0 EXECUTION
- 3.01 INSPECTION
- A. Verify that surfaces and structures receiving signs are clean, complete, in alignment, plumb, true, finished and cured before starting installation.
- B. Inform Contracting Officer of completion of signs in shop; permit Contracting Officer to inspect signs before preparation for shipping.
- 3.02 INSTALLATION





## 10000 - Specialties

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- A. Wrap, mask or otherwise protect paint finish of substrates to avoid damage during die cut installation. Contractor shall be responsible for refinishing or replacing any damaged components to Corpus Christi Army Depot's satisfaction.
  - B. Install in accordance with manufacturer's printed instructions and as indicated in the Contract Documents.
  - C. Permit newly painted surfaces to cure for at least 72 hours prior to die cut application.
  - D. Apply graphics level in position shown on Contract Documents.
  - E. Position graphics in place with carrier sheets.
  - F. Secure graphics to substrate; in-place graphics shall have full contact with substrate, and contain no trapped air or loose edges.
- 3.03 FIELD QUALITY CONTROL: Installed die cuts will be inspected, four weeks after installation, for evidence of discoloring, disintegrating finish, and other manufacturing faults, and for evidence of faulty installation. Replace rejected die cuts at no additional cost to the Contracting Officer.

END OF SECTION 10440t



## 10000 - Specialties

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### SECTION 10450

#### METAL DETECTORS

- 1.0 DESCRIPTION OF WORK: Metal detectors shall be engineered with complete solid state modular system with interchangeable functions. Utilize the latest electronic devices available. The detector shall be able to be installed in the closest proximity of doors. The detector shall have the smallest antennas possible and be designed to discriminate between dangerous weapons and other objects made up of lighter masses of metallic components. The detector unit shall be harmless to pacemakers and in case of power failure, continue to function under the continuity unit.
- 2.0 SUBMITTALS:
- 2.1 Submit all product data and specifications for review and approval.
- 2.2 Guarantee: The Contractor shall present before the final payment for this system a certified statement by the manufacturer or his agent that he has generally supervised the installation and testing of this system, and that he will warrant the system for one year after the date of acceptance by adjusting or replacing defective material or workmanship.
- 2.3 Technical Characteristics:
- 2.3.1 Electrical Requirements: 115 volts, single phase, 60 HZ and 60 watts.
- 2.3.2 Temperature Range: -20 C. to +55 C (-4 F. to +131 F.).
- 2.3.3 Dimensions of Control Box: Approximate, 29 cm. x 23 cm. x 10 cm. (11" x 9" x 4").
- 2.3.4 Antennas: 7 cm (3") thick, 20 cm (8") wide approx. 210 cm (6'-11") high (varies according to installations.)
- 2.3.5 Activation of Alarm: A normal open contact and normal closed contact activated by an open contact when apparatus has received the alarm magnetic signal.

END OF SECTION 10450



## SECTION 10500

### METAL LOCKERS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of metal lockers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.1 Manufacturer:
- A. Interior Steel Equipment Company, Cleveland, Ohio.
  - B. Penco Products Inc., Oaks, Penn.
  - C. Lyon Metal Products, Inc., Aurora, Ill.
  - D. Republic Steel Corp., Youngstown, Ohio
  - E. Or approved equal.
- 1.2 Shop Drawings: Submit for approval prior to proceeding with the fabrication and erection of any part of this work.
- 2.0 PRODUCTS:
- 2.1 Construction: Built on the unit principle of construction, each having its individual door and frame manufactured in accordance with Federal Specifications AA-L-486 and amendments thereto.
- A. Material: Material shall be best of its respective kind, free from buckle, scale and imperfections, specially treated to give a high grade enamel finish.
  - B. Door Frame: Door Frame members shall be formed into channel shapes from 16-gauge full pickled steel. Corners shall be tenoned and electrically welded, making a solid and rigid one-piece structure. Frames shall be punched for attaching to the body on maximum twelve-inch centers. No exposed bolt or rivet heads on front of frame or locker.
  - C. Door: Doors shall be made of 16-gauge patent level, pickled metal furniture steel. Doors shall be reinforced with angle bend at top and bottom and a channel formation at hinge side. Doors shall be further reinforced with box formation on locking side. Construction of door will prevent springing and close quietly against rubber cushions. Single tier door 18" wide and wider shall have a reinforcing panel. (Storage Cabinets).
  - D. Body: Body of lockers and cabinets including tops, back, sides and shelves shall be made of 24-gauge steel; bottoms of not less than 20-gauge steel. Sides shall be flanged to give double thickness of metal at connections. Tops, bottoms and shelves shall be flanged all four sides with channel or rolled front of shelves. Shelves shall be full depth and bottom flush with the frame.



## 10000 - Specialties

- E. Ventilation: Lockers and cabinets shall have louvers at front and lockers shall have perforations at back as detailed.
- F. Bases: Bases shall be welded 16-gauge "Z" plates as detailed.
- G. Trim: Provide 18-gauge trim. Filler pieces shall be same construction as locker front.
- H. Gaskets: Include all felt gaskets and insulation required.
- I. Equipment: Provide perforated hat shelves and hooks as detailed. Hooks shall be 1/4" round steel cadmium plated with ball points and attached with two bolts. In storage cabinets provide solid 16-gauge sheet steel adjustable shelves.

### 2.2 Hardware:

- A. Hinges: Five knuckle, tight pin hinges shall have concealed fastenings welded to the door frame and bolted or riveted to side flange of door. Doors 42" high or less have two hinges and doors over 42" have three hinges.
- B. Handle: Operating door latch for locking device shall be lift type enclosed in and protected by a stationary handle made of unbreakable alloy, die cast and chromium finish. Handle attached to door with four or more points of contact. Design to provide padlock attachment, with padlock strike as an integral part of handle.
- C. Locking Device: Quiet, positive, automatic, by means of a spring or gravity actuated locking channel enclosed on four sides with a box formation on the door engaging with the door jamb opposite hinges. Device shall be prelocking, permitting self-latching without manipulating door latch. Locking device shall be tamper-proof, pick-proof and equipped with rubber silencers. Rubber cushions shall be riveted to lock bar catches on door frame. Single tier lockers shall have a three point contact and double tier lockers shall have a two point contact.
- D. Locks: At lockers and material cabinets provide Yale R-481 1/2 lock or approved equal. Lockers shall have padlock provisions. Locks for lockers and material cabinets shall be separate combinations different from each other. Each room shall have separate combinations each different from each other room.
- E. Number Plates: All double tier lockers shall be furnished with aluminum number plates attached to the top of the door. Characters shall be filled with black enamel.

Numbers shall run consecutively as follows:

Each Room-	1, 2, 3, etc.
Corridors-	1st Floor - 1-1, 1-2, 1-3, etc.
	2nd Floor - 1-1, 1-2, 1-3, etc.
	3rd Floor - 1-1, 1-2, 1-3, etc.

### 2.3 Finish:

- A. All steel parts to be thoroughly cleaned, treated with a phosphate solution which protects against rust and corrosion and a heavy coat of manufacturer's standard finish of selected manufacturer's stock color.



- B. Locker fronts shall be sprayed by means of Electrostatic spray system which will give uniform coverage of paint for longer and harder usage. Enamel shall be baked at 300-degrees.

**3.0 EXECUTION:**

3.1 Installation: Lockers shall be installed square, true and plumb.

3.2 Adjusting:

- A. Adjust doors, locks, etc., to operate properly before leaving job.
- B. Touch-up any scratched or damaged surfaces.

END OF SECTION 10500



## 10000 - Specialties

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### SECTION 10520

#### FIRE EXTINGUISHERS, CABINETS, AND ACCESSORIES

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of fire extinguishers, cabinets, and accessories. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
  - 2.1 Fire Extinguishers shall be Underwriters' Laboratories (UL) listed and/or Factory Mutual System (FM) approved for their intended use in compliance with National Fire Protection Association (NFPA) Standard 10 and its appendices. Fire extinguishers shall be clearly marked to indicate extinguisher suitability according to class of fire.
  - 2.2 Fire Extinguisher Cabinets and Accessories shall be in compliance with NFPA 10 and its appendices and shall be of sufficient size to house fire extinguishers of the type and capacity required.
- 3.0 EXECUTION:
  - 3.1 Fire Extinguishers shall be distributed and maintained in compliance with NFPA 10 and its appendices.
  - 3.2 Fire Extinguisher Cabinets and Accessories shall have the locations of fire extinguishers readily recognizable by the use of markings that are not part of the extinguisher itself.

END OF SECTION 10520



## SECTION 10551

### MAIL CHUTES

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of mail chutes and mail boxes. Materials shall match existing materials and/or as shall be directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
  - 2.1 General: All products shall comply with U.S. Postal Service requirements for construction and installation of units serviced by USPS carriers.
  - 2.2 Mail Chutes shall have sides and back that are of a continuous one-piece construction extending from floor to ceiling on each floor and extending 4 feet 6 inches above finish flooring on top floor. Back and sides shall be fabricated of aluminum with a 0.105-inch minimum thickness and alloy 6063-T5 extrusions with satin anodized finish complying with NAAAM-M31C2IA3I. Removable front panels shall be made of 3/16-inch tempered glass, 1/4-inch float glass, or transparent polycarbonate resin plate, set into continuous one-piece frames and covers. Frames and covers shall be fabricated from aluminum with a 0.125 inch minimum thickness, and alloy 6063-T5 extrusions with satin anodized finish complying with NAAAM-M31C2IA3I, or color anodized, bronze, or standard bronze statuary finish.
    - 2.2.1 Furnish Manufacturer's Standard Cast-Metal Floor and Ceiling Fascia and Lock Band finished to match front frames and covers. Furnish lock band with acceptable locating device and keyed lock which prevents key removal if locking device is not secured.
    - 2.2.2 Mail Slot shall be metal pocket with cigarette ejector and brass finish. Inscribe "U.S. MAIL" on face of mail slot.
    - 2.2.3 Bundled Mail or Package Chute shall be constructed similarly to standard mail chutes. Furnish complete with removable frames, hinged lock band, bottom deflector or baffle slow-down, and mail openings on each floor. Fabricate chute size 14 inches wide and 7 inches deep, unless otherwise indicated. Bundled mail chutes will not require USPS approval.
    - 2.2.4 Locked Receiving Mail Box shall be constructed of aluminum alloy 6063-T5 with satin anodized finish complying with NAAMM-M31C2IA3I or bronze with statuary finish. Boxes shall be 36 inches by 20 inches by 12 inches.
  - 2.3 Mail Boxes:
    - 2.3.1 Letter Slot shall be metal, designed for flush mounting. The legend "U. S. MAIL" must be plainly inscribed on every mail opening.
- 3.0 EXECUTION: Install postal specialties so that they comply with U.S. Postal Service requirements.

END OF SECTION 10551



## SECTION 10610

### DEMOUNTABLE PARTITIONS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of demountable partitions. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
- 2.1 General Requirements: Movable partitions shall be floor-to-ceiling type, designed for erection on finished floors, and shall include doors, windows, fasteners, and accessories required for the installation. The partition system shall be capable of accommodating electrical wiring, outlets, and switches and shall be readily demountable without damage to panels, framing, electrical work, and other major components.
- 2.2 Fire-Resistive Rating and Test: Partitions shall have the fire endurance rating designated. Fire-resistance rating shall be determined in accordance with ASTM E 119.
- 2.3 Sound Transmission Class and Test: Where sound-rated partitions are required, partition assemblies shall have a minimum STC of 40. STC range shall be determined in accordance with Sound Transmission Test or Two-Room Method and reported in accordance with the appendix to ASTM E 90 for 11 frequency data or ASTM E 413 for 16 frequency data.
- 2.4 Panel Units shall be manufacturer's standard construction except that gypsum wallboard shall be a minimum of 5/8 inch thick and shall conform to ASTM C 36. Gypsum backing board, if used, shall conform to ASTM C 442.
- 2.5 Framing System: The framing system shall consist of extruded anodized aluminum or roll-formed steel components that include ceiling runners, floor track, starting units, studs or posts, post covers if applicable, bracing, and suitable treated fasteners to prevent corrosion. The framing system when assembled with panel units shall form a rigid, stable partition.
- 2.6 Doors, Frames, and Hardware: Doors shall be 1-3/4 inch flush hollow metal of a size to provide 3/32-inch clearance at jambs and head. Door frames shall provide a compatible appearance with other trim components, shall be a minimum 18-gauge cold-rolled steel or extruded anodized aluminum constructed to incorporate a cushion door stop at the head and both jambs, and shall allow for variations in floor level. Door hardware shall be the manufacturer's standard type hardware, except all doors shall receive 1-1/2 pairs of 4-1/2 inch by 4-1/2 inch butts.
- 2.7 Finishes: Exposed steel or aluminum surfaces shall be prefinished. Gypsum wallboard shall be painted or finished with a minimum 6-mil vinyl wall covering, as required.
- 2.8 Base Trim shall be 4-inch PVC without exposed fasteners, 4-inch vinyl cover base with snap-on capabilities, 4-inch vinyl cover base applied with adhesive, or 4-inch metal clip on base cover, as required.





## 10000 - Specialties

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- 3.0 EXECUTION: Partitions shall be erected plumb and straight after floor covering and finished ceiling are in place. Doors shall be hung to swing freely and hardware shall be carefully fitted and adjusted. Glass for glazed openings shall be installed on shims in a vinyl or polyurethane foam gasket. Glass stops shall be installed without exposed fastenings.

END OF SECTION 10610



## 10000 - Specialties

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### SECTION 10617a

#### MOVEABLE METAL PARTITIONS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of moveable metal partitions. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
- 2.1 Freestanding Partition Systems shall consist of individual panels, connector posts, and framing components. Nominal panel height shall be 5 feet-0 inches.
- 2.2 Panels shall be of manufacturer's standard width and height, constructed of 1/8-inch S2S tempered hardboard facing laminated to a core material. Total thickness shall be 1-9/16 inches.
- 2.3 Panel Face Coverings shall be vinyl, plastic laminate, fabric, natural hardwood, or baked enamel on steel substrate.
- 2.4 Panels shall meet the UBC requirements for Class I Finish when tested as a composite unit.
- 2.5 Framing Members shall be extruded aluminum shapes in 6063-T5 Alloy and 22-gauge pre-finished steel.
- 2.6 Exposed Components shall have anodized or baked acrylic paint finish.
- 2.7 Panel Frame Design shall provide connection and attachment of connector posts and various framing components with the use of simple hand tools. Each panel unit shall be able to be individually free standing or connected to other panels.
- 2.8 Sound-Absorbing Panels shall be constructed of flame-resistant decorator fabric applied over a reinforced wood frame and fiberglass core. Flame-resistant fiberglass insulation shall be held in place by galvanized steel wire netting. Total panel thickness shall be 2-1/2 inches providing a minimum noise reduction coefficient (NRC) of 0.75.
- 3.0 EXECUTION: Additional framing components shall be provided as required to assemble the freestanding partitions. Components include, but are not limited to, vinyl edge inserts and filler caps, individual panel supports, and wall connectors.

END OF SECTION 10617



## SECTION 10617b

### MOVEABLE & DEMOUNTABLE PARTITIONS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of moveable and demountable partitions. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.1 Provide pre-manufactured and pre-fabricated panels, delivered to the site in units ready for final adjusting and installation. The Project will not allow the on-site fabrication of panels nor the delivery of component parts requiring total field fabrication.
- 1.2 SUBMITTALS: Prior to installation, submit to the Contracting Officer for review the following:
  - A. Complete and fully descriptive manufacturer's literature naming each component including method of assembly, materials, dimensions and finishes.
  - B. A physical sample of each component in the color and finish proposed to be provided.
  - C. A physical sample of the vinyl wall covering in all available colors for the Contracting Officer's selection.
  - D. A layout of partition system showing walls and doors and hardware for each door.
- 1.3 DELIVERY, STORAGE & HANDLING: Deliver demountable gypsum panel partition components cartoned or crated to provide protection during transit and job storage.
- 1.3.1 Inspect partition components upon delivery for damage. Minor damages may be repaired provided finish items are equal to new work and acceptable to the Contracting Officer. Remove and replace damaged items as directed.
- 2.0 PRODUCTS
- 2.1 DEMOUNTABLE PARTITION SYSTEM - GENERAL: Provide demountable, metal studded gypsum panel partitions that shall interface with existing acoustical or screw slot ceiling and be installed over existing carpet tiles or carpet with no damage to the ceiling or carpet. Interchangeable standardized units for solid panels, glazed panels and doors can be rearranged in any desired combination within a given wall space.
- 2.1.2 Removal of individual panels at any location without removing adjacent units (point access capability) must be possible.
- 2.1.3 Salvability for over 90% recovery of installed materials with negligible damage to adjacent floors, walls and ceilings.
- 2.1.4 Continuous installation with fasteners concealed.



## 10000 - Specialties

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- 2.1.5 Provide demountable gypsum panel partitions complete with finished floor and ceiling channels, vertical support framing, glazing framing and stops, anchorages and accessories for complete, stable installation.
- 2.1.6 The integral support system shall be designed to support wall hung loads so that it is possible to attach objects to the wall system directly by means of system fasteners. Fasteners shall be designed to attach bookshelves, storage components, map rails, casework assemblies, writing and chalkboard surfaces.
- 2.1.7 Wall components shall assemble into a rigid structure with tight straight line joints. Completed installations shall be free of exposed nuts, bolts and rivets. All units shall allow access into the cavity or be readily removable from either side without disturbing the adjacent unit. All modular door units and glass panel units shall be interchangeable with gypsum panel units. Three-way and four-way intersections shall be made at any point without regard to module. Levelling of the system shall be made by an internal leveling system. Shims not expressly designed by the partition system manufacturer for this purpose shall not be allowed nor shall they be visible.
- 2.1.8 Rigidity: 1/2" maximum deflection of any panel after complete installation. No lateral movement at top and bottom track.
- 2.2 PANELS: One piece bevelled edge full-height unless otherwise indicated.
  - 2.2.1 Type X gypsum wallboard: 5/8" thick.
  - 2.2.2 Panel width: 30"; provide one standard panel width.
  - 2.2.3 Finish: Vinyl wall covering standard with the manufacturer but of no less grade than Type II. Color and finish selected by the Contracting Officer.
  - 2.2.4 Aluminum Components and Finish: All exposed aluminum shall be extruded from a controlled alloy billet, to maintain color anodizing uniformity. Aluminum finish shall be anodized with directional brushed finish in a clear anodized color. Plastic not acceptable.
- 2.3 CONCEALED RUNNERS AND FRAMING: Manufacturer's standard vertical and horizontal members, galvanized or painted steel. Plastic not acceptable.
  - 2.3.1 Maximum distance for stud placement: 30" o.c.
  - 2.3.2 25 gauge steel stud, 2-1/2" interior wall cavity.
  - 2.3.3 DOOR FRAMES: Hollow metal, 3-piece knockdown frames shall be integral with the system and factory mortised to receive finish hardware and 1-3/4" doors.
  - 2.3.4 Provide aluminum frames with milled heads and snap-in trim.
  - 2.3.5 Aluminum door frames shall be assembled plumb and square. Frames are to be pre-mortised for hardware including proper reinforcing, drilling and tapping; frame miter shall be anchored with concealed clips.
  - 2.3.6 Aluminum: reversible non-handed frames color anodized (color selected by the Contracting Officer).
- 2.4 DOORS: 1-3/4" x 3' Off x 6' 8".
  - 2.4.1 AWI quality grade: Premium.



- 2.4.2 Face veneer: plain sliced, stain grade, birch.
  - 2.4.3 Core: solid core, AWI type 'IC" particleboard.
  - 2.4.4 Doors shall be factory machined and factory pre-fit.
  - 2.5 TRANSOM PANELS: Material and finish to match wall panels.
  - 2.6 BASE: Manufacturer's standard integral base or 4" high top set vinyl (color shall be selected by the Contracting Officer).
  - 2.7 UTILITY PROVISIONS: System shall provide for the passage of electricals and utility lines both vertically and horizontally throughout the system. It shall be possible to use standard gangable electrical boxes for required outlets in any standard panel.
  - 2.8 SOUND AND LIGHT SEALS: Prevent sound and light leakage with the use of closed cell foam tape applied to ceiling surfaces.
  - 2.8.1 STC: 39 when tested in accordance with ASTM #90-75.
  - 2.9 GLAZING: System shall be capable of accepting Corpus Christi Army Depot furnished 4' x 8' x 1/4" thick tempered glass. The glazing members shall meet the same aluminum specifications as the other aluminum components. Glazing can be placed anywhere within the wall system without supplemental internal bracing.
  - 3.0 EXECUTION
  - 3.1 INSTALLATION: Coordinate partition work with work of other contractors working at the site. Avoid damage to installed work.
  - 3.1.1 Repair damaged or defaced work or replace with new work as acceptable to the Contracting Officer. Completely refinish defaced partition components with factoryfinish materials or replace defaced components.
  - 3.1.2 Furnish and install anchoring devices required, secure partitions to floor, ceiling and walls using concealed fasteners.
  - 3.1.3 Install partitions rigid, level, plumb and in alignment with components secured together in accordance with manufacturer's instructions.
  - 3.1.4 Provide through posts to ceiling, or other concealed supports, as required to assure lateral stability of partition runs.
  - 3.1.5 Install continuous and positive seal to prevent light and sound transmission at partition contacts with floor, ceiling, wall and other abutting surfaces.
  - 3.1.6 Adjust hardware and leave doors in proper operating condition.
  - 3.1.7 Provide instructions and specialized tools to the Corpus Christi Army Depot in disassembling and re-assembling the partition system.
- END OF SECTION 10617b



## SECTION 10618

### WIRE MESH PARTITIONS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of wire mesh partitions. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.02 Samples: Submit wire sample and hardware of each item for approval before fabrication.
- 1.03 Shop Drawings: Submit for each item for approval before fabrication.
- 2.0 PRODUCTS:
- 2.1 Material:
- A. All wire work shall be built, hung and secured as shown by detail drawings and as specified.
  - B. Wire to be used for all guards, partitions, grilles, etc., shall be 11-gauge, 1 1/4-inch diamond mesh unless otherwise specified.
  - C. All steel and iron wire work for the exterior of the building, including frames and all parts and fittings shall be not galvanized after fabrication.
  - D. All wire work in connection with stairwork, including stair partitions and guards, window guards and barriers shall be 11 gauge, 1 1/4-inch diamond mesh.
  - E. All outside and inside wire work, unless otherwise specified, shall be of 1 1/4-inch diamond mesh and 7/8-inch channel frames, and where so indicated on details, shall have fillers, 1/8-inch thick, covering the channels.
  - F. Furnish and set all braces, clip angles, expansion bolts, tap screws, etc., required to set and secure the wire work in place.
  - G. All wire mesh panel frame members shall be mortised and tenoned at corners.
  - H. Padlocks for guards, etc., are specified under Hardware, Section 8H. The Contractor for the wire work shall rivet the padlock chains to wire work as directed.
  - I. Hardware must be equal to samples in office of Executive Director. A sample of each item of hardware must be submitted for approval.
- 2.2 Wire Guards:
- A. Window, Door and Transom Guards: Furnish and install wire mesh guards on the interior and exterior faces of windows and transoms where indicated on the drawings.
    - 1. Unless otherwise indicated, guards shall be hung with 3 1/2 x 2 1/4-inch fast pin steel butts and shall be secured in place with hook rods, snaphooks, and chains. Interior guards shall be provided with vertical slots for passage of window panels.



2. Guards at windows in stain enclosures, corridors and at roof levels above street level shall have padlocks in lieu of hook rods, snaphooks, chains and pins.
  3. Window guards, unless otherwise shown, shall cover the entire window opening. Where hinged guards cannot be opened due to obstructions, provide removable upper sections as detailed.
  4. Where indicated on drawings, windows at roof levels shall be provided with hinged guards on the lower sash as indicated on the detail.
- 2.3 Outside Air Intake Guards: Guards of outside air intakes shall be constructed of 14-gauge galvanized steel channels. The guards shall be hung with 3 1/2" x 2 1/8" fast pin steel butts secured to steel angle frames and furnished with hinged hasps secured with padlocks.
- 2.4 Pipe Trench Guard: Furnish and install in openings at end of pipe trenches in walls of boiler room, wire guard or screen of No. 11-gauge wire, 3/8" mesh in 7/8" channel frame, tap screwed to angle frame. All material shall be galvanized and shall fit snug around pipes and shall blank off the entire end area of the trench. Obtain dimensions and verify conditions at the building.
- 2.5 Wire Partitions:
- A. All wire mesh partitions shall be formed with panels of No. 11-gauge, 1 1/4 inch diamond mesh in 7/8 inch channel frames, secured to framework of partition with tap screws or through bolts to suit conditions. All angle and channel framework necessary to secure the partitions in place, except framework of stair conditions, shall be furnished and erected as part of same.
  - B. Doors in partitions shall have an angle frame braced at corners, hung with butts and provided with cylinder rim latch secured as shown and operated by key outside and thumbpiece inside.
  - C. Hardware in connection with doors is specified under the Hardware Section but shall be set in place under this Section of Work.
  - D. When wire mesh panels of partitions are more than 5 feet in length or height they shall be reinforced with stiffening channels riveted together through the mesh in center of panels.
  - E. Wire mesh partitions enclosing custodian's workshop shall include framing of steel tubing, angles, wire work and door. The wire to be used shall be 11-gauge, 1 1/4-inch diamond mesh, in 7/8-inch channel frames. Wire work shall be secured in place with through bolts and tap shall be secured in place with through bolts and tap screws. All uprights and horizontal framing members of partitions and framework of doors shall be of sizes given on drawings. Tubing shall be as indicated on drawings. The uprights shall continue to ceilings and have angle iron clips at top and bottom expansion bolted to concrete ceilings and expansion bolted or screwed to floors as required, all as detailed. The horizontal members shall be welded to posts as detailed.
- 2.6 Wire Shelving:
- A. Furnish and install shelves of 11-gauge, 3/4-inch wire mesh on 3/8-inch diameter rod frame in closets and other locations indicated on drawings. Shelves shall be secured in place with metal clips tap screwed to wrought iron brackets and hanging rods.
- wardrobes are specified under the wardrobe section of work.



## 10000 - Specialties

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B. Furnish and install shelving in metal lined cabinets where indicated, constructed of 3/4" expanded metal welded in a bent metal frame as indicated.

2.7 Wire Barriers: Wire barriers for the purpose of closing the stairways shall be placed where indicated. Barriers shall be constructed of 1 1/4 inch diamond mesh, in frames of 1-inch x 1/2-inch channels with cover plates. Barriers shall be fitted with hardware. Lock shall be attached to plate on barrier.

2.8 Wire Mesh Panels In Stairs:

A. Wire mesh panels in connection with stair construction shall consist of 9 gauge, 1 1/4-inch square mesh wire fabric and channel frame members.

B. Wire mesh panels in certain stairs shall be constructed of die pressed crimped woven wire mesh panels of nine (9) gauge wire, two (2) inch square mesh, set in channel frame, secured in place.

2.9 Painting: All inside wire work, including all frames, fixtures, etc. shall have one shop coat paint. After erection or installation, all damaged surfaces of shop coat and all bolts and rivets shall be touched up with the paint.

3.0 EXECUTION:

3.1 Installation:

A. Erect partitions, guards, etc., in a rigid manner, straight and plumb, with all horizontal lines level.

B. Check all connections, attachments, etc. before leaving job.

3.2 Adjusting:

A. Adjust hardware and leave in perfect working order.

B. Adjust door hinges, hasps, etc.

C. Provide Additional Field Bracing as necessary for rigid, secure installation.

END OF SECTION 10618





## SECTION 10800

### TOILET & BATH ACCESSORIES

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of toilet accessories other than porcelain type tile wall accessories. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
- 2.1 Finishes: Finishes on metal shall be provided as follows:
- 2.1.1 On Stainless Steel: No. 4 general-purpose polished.
- 2.1.2 On Carbon Steel, Copper Alloy, and Brass: Chromium-plated, bright.
- 2.2 Miscellaneous Accessory Items:
- 2.2.1 Mirror, Glass (MG): Glass mirror shall conform to Fed. Spec. DD-M-4II.
- 2.2.2 Mirror, Metal (MM): Metal mirror shall be stainless steel or chromium-plated steel, mirror quality, 0.037-inch minimum thickness, edges turned back 1/4 inch and recess-fitted with fiberboard backing, mounted with concealed theftproof fastening. Size shall be as required.
- 2.2.3 Grab Bar (GB): Grab bar shall conform to Fed. Spec. WW-P-541. Grab bar shall be form and length as required. Flange shall have screw mounting holes concealed on the lip of the flange, Installed bars shall be capable of withstanding a 500-pound vertical load without becoming loose from the fastenings and without obvious permanent deformation.
- 2.2.4 Shelf, Glass (SG): Glass shelf shall conform to Fed. Spec. WW-P-541 and shall be supported between brackets or on brackets. Shelf shall be plate or float glass, width and length as required. Separate supports shall be stainless steel.
- 2.2.5 Shelf, Metal, Heavy-Duty (SMHD): Heavy-duty metal shelf shall be stainless steel supported between brackets or on brackets not more than two feet on center. Thickness of shelf and brackets shall be not less than 0.07 inches. Shelf shall have rounded corners with minimum 1/2-inch lipped front edge, designed to support 60 pounds per linear foot. Width and length shall be as required.
- 2.2.6 Shelf, Metal, Light-Duty (SMLD): Shelf shall be supported between brackets or on brackets. Width and length shall be as required. Shelf and separate supports shall be stainless steel.
- 2.2.7 Soap and Grab Bar Combination, Recess-Mounted (SGR): Stainless steel modified to provide a grab bar. Plastic insert dish shall be furnished.
- 2.2.8 Towel Bar (TB): Towel bar shall be stainless steel, length as required. Bar shall be minimum 3/4 inch in diameter.
- 2.2.9 Towel Pin (TP): Towel pin shall have concealed wall fastenings; pin shall be integral with or permanently fastened to wall flange, approximately 4-inch projection.



## 10000 - Specialties

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### 2.3 Dispensers and Receptacles:

2.3.1 Paper Towel Dispenser (PTD): Paper towel dispenser shall conform to Fed. Spec. WW-P-541.

2.3.1.1 Mounting S, Surface: Style N or O.

2.3.1.2 Mounting R, Recessed: Style P, Q, or T.

2.3.2 Sanitary Napkin and Tampon Disposer (SND): Sanitary napkin and tampon disposer shall conform to Fed. Spec. WW - P -541, stainless steel. Reusable liner of the type standard with the manufacturer shall be provided.

2.3.3 Sanitary Napkin and Tampon Dispenser (SNTD) : Sanitary napkin and tampon dispenser shall conform to Fed. Spec. WW - P -541.

2.3.4 Waste Receptacle (WR) shall conform to Fed. Spec. WW - P -541.

2.3.5 Facial Tissue Dispenser (FTD) shall conform to Fed. Spec. WW - P -541.

2.3.6 Toilet Tissue Dispenser (TTD) shall conform to Fed. Spec. WW - P -541.

2.3.7 Toilet Paper Holder (TPH) shall conform to Fed. Spec. WW - P -541.

2.3.8 Soap Dispenser (SD) shall be liquid type consisting of a stainless steel tank with hold capacity of 40 fluid ounces.

2.3.9 Soap Holder (SH) shall conform to Fed. Spec. WW - P -541.

### 2.4 Shower Curtains and Rods:

2.4.1 Shower Curtain (SC) shall conform to Specifications, size as required to suit conditions.

2.4.2 Shower Curtain Rods (SCR) shall be stainless steel 1 inch OD by 0.049 inch minimum, straight or bent as required to meet installation condition:

2.5 Hand Dryer shall be electrically operated conforming to Fed. Spec. W-H-50. Unit shall be surface-mounted, semi-recessed or flush-mounted as required. Cover face shall be polished aluminum, cadmium-plated, polished chrome, stainless steel, or porcelain. Fan shall deliver a minimum of 150 cfm at the discharge end of the nozzle.

2.6 Ash Urn shall be wall-mounted, paraboloidal shape, two quart capacity conforming to Fed. Spec. RR-A-1255. Urn shall be 22-gauge type 304 stainless steel with satin finish or satin bronze finish.

### 2.7 Janitorial Material:

2.7.1 Mop and Broom holder shall be 18-gauge stainless steel, satin finish, 8 inches deep in standard lengths as required.

2.7.2 Utility Shelf with mop and broom holders shall be 18-gauge stainless steel, satin finish, 8 inches deep in standard lengths as required.

2.7.3 Pail or Ladder Hook shall be 12-gauge stainless steel, bright polished finish projecting 8 inches from wall, 6 inches high, and 1 inch wide.

3.0 EXECUTION: Anchors and fasteners shall be capable of developing a restraining force commensurate with the strength of the accessory to be mounted and shall be well suited for use with the supporting



## 10000 - Specialties

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construction. Where exposed fasteners are permitted, they shall have oval heads and finish to match the accessory, except exposed fasteners in designated areas shall be of tamper-proof design.

END OF SECTION 10800



## 10000 - Specialties

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### SECTION 10900

#### WOOD WARDROBES

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of wood wardrobes. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with product manufacturers recommendations. Demolition and removal of materials' shall be as required to support the work.
- 1.1 Manufacturer:
- A. Richard-Wilcox, Aurora, Illinois
  - B. Emco Inc., Kansas City, Missouri
  - C. School Supply Co., Grandview, Missouri
  - D. Or approved equal.
- 1.2 Submittals:
- A. Samples: Submit three (3) samples of oak for approval before any of the doors are constructed.
  - B. Shop Drawings: Submit shop drawings in full detail of all work included in this Section for the approval of the Contracting Officer before proceeding with the fabrication of any part of this work.
- 1.3 Guarantee: Entire wardrobe, equipment and door operating mechanism shall be guaranteed against all mechanical defects and defects of workmanship or material for a period of two (2) years.
- 2.0 PRODUCT:
- 2.1 Materials:
- A. Wardrobe Doors (Wood receding type):
    - 1. 1-3/4-inch flush veneered doors with built-up core and hardwood edge strips.
    - 2. Face veneer of doors shall be first quality, clear, plain, sawn, Appalachian Mountain red oak and shall be thoroughly machine sanded and then hand sanded with 00 sandpaper to produce a smooth surface of finishing.
    - 3. The doors when completed shall fit the recess snugly and the mechanism for openings and closing the doors shall operate smoothly, silently and easily.
  - B. Wardrobe Interior:
    - 1. Each section of wardrobes shall be provided with a coat and hook rack consisting of two (2) wire mesh shelves and three (3) hood strips with double prong coat hooks and one (1) 16-gauge metal shelf, all as indicated on detail.
    - 2. Height of bottom row of hooks in wardrobes shall be as directed.



2.2 Hardware:

- A. All wardrobe doors shall be fitted with approved door control hardware consisting of rigid offset pivot arms (top and bottom) connected with through pins to a continuous 1 inch dia. cold rolled solid steel bar.
- B. Pivot arms shall be fitted with an adjustment device, universal joints, and ball bearing pivots, all machined to accuracy.
- C. Each door shall be equipped with anti-rattle latches with handles of solid bronze; also bolts, stops, guides, bumpers, etc., as required.
- D. Operating hardware shall be so constructed that the doors shall be held in perfect alignment and so rigidly that there will be no vibration, deflection or other movement when pressure is applied to the face of the doors in the closed position, with means provided for adjustment of the doors in all directions. The door operating mechanism shall be so constructed that all doors can be opened or closed independently of each other.
- E. All hardware shall be approved before it is installed.
- F. All operating hardware inside of wardrobe shall be steel or malleable iron, except knobs or handles of latches and the floor plates for pivots, which shall be solid bronze. The floor plates for pivots shall be set on the floor and shall be secured to same with expansion bolts.

2.3 Schedule of Hardware:

- 1. Pair of Doors:
  - a. Each door shall be provided with one pull, B. of E. No. 655.
  - b. One door shall be provided with a 12" long surface type top bolt, Corbin No. 1580 or approved equal, on interior surface of door.
  - c. Other door shall be provided with mortise cylinder dead lock operable by knob at all times from inside of wardrobe. Lock to be Sargent No. 4823 or approved equal. This lock to lock into other door.
  - d. Also provide approved heavy type bullet or friction catch at head of each door to hold doors in closed position.
- 2. Single Door:
  - a. One pull as specified by the Contracting Officer
  - b. Provide mortise cylinder dead lock operable by knob at all times from inside of wardrobe. Lock to be Sargent No. 4823 or approved equal. This lock to lock into jamb or edge of adjoining door.
  - c. Also provide approved heavy type bullet or friction catch at head of door to hold door in closed position.
- B. Keying:
  - 1. Locks for doors to wardrobes shall have separate combinations for wardrobes in each room; each room combination different from each other room, masterkeyed in sets by floors.



## 10000 - Specialties

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2. Wardrobe locks shall be capable of being grand masterkeyed by floors with the room door locks specified by the Contracting Officer and great grand masterkeyed with the door locks for the entire building.
  3. Provide three keys for each lock and three masterkeys.
- D. Finish: All hardware shall be finished as specified in by the Contracting Officer.

### 2.4 Painting:

- A. All exposed metal work of jambs, head and coat and hat hook racks shall be cleaned and painted as specified in Section 08110 before installation of this work at the job. The final and finishing painting shall be done under Section 09920.
- B. All finish oak woodwork shall be given an acid or oil stain and then filled with a paste filler, and then given one coat of American lacquer or shellac, as directed before leaving the mill. All other woodwork of wardrobes shall be primed as specified in Section 06220. The finish painting will be done under the work of Section 09920.
- C. Stain and filler may be applied in one operation provided that the material to be used is factory mixed and is approved by the Contracting Officer before application.

END OF SECTION 10900

END OF SPECIFICATION SECTION 10 - Specialties



## SECTION 11111

### OFFICE EQUIPMENT

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of Office Equipment. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

#### 2.0 PRODUCTS

##### 2.1 Computers

##### 2.1.1 Intel 300MHZ Pentium Based Desktop computer system.

System shall be non-proprietary, carry a three (3) year manufacturer warranty and include at a minimum:

- A. PCI bus
- B. Level 2 cache of 512KB SRAM
- C. Standard Mid-Tower Case with 300 Watt power supply
- D. Two (2) 3.5" 1.44Mb diskette drives
- E. 32x CD Rom Drive
- F. 64 Mb System Memory, Upgradeable to 128Mb
- G. 8 Gb Formatted, Fast SCSI-II Hard Drive with controller
- H. PCI Controller with two (2) serial ports and one (1) parallel port.
- I. 64 Bit PCI Window Accelerator Video Card with 4Mb RAM
- J. 101 Key Enhanced Keyboard
- K. Microsoft version 2.0 ergonomic mouse with drivers
- L. Latest versions of Windows and Dos as specified by the Contracting Officer.

##### 2.1.2 Intel 233MHZ Pentium Based Notebook computer system.

System shall be non-proprietary, carry a three (3) year manufacturer warranty and include at a minimum:

- A. Level 2 cache of 256KB
- B. One (1) 3.5", 1.44 Mb diskette drive
- C. 32 Mb System Memory, upgradeable to 80Mb
- D. 4 Gb formatted Hard Drive



## 11000 - Equipment

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- E. PCI Controller with one (1) serial port, one (1) parallel port, one (1) mouse/keyboard port and one SVGA monitor port.
- F. 11.3" Active Matrix SVGA color display
- G. 84 Keyboard with built-in Mouse
- H. 16 Bit Audio
- I. Rechargeable Lithium Ion Battery
- J. Two (2) type II PCMCIA Slots
- K. Latest versions of Windows and Dos as specified by the Contracting Officer.

### 2.2 Monitors

#### 2.2.1 15" Color SVGA Monitor

- A. 15" Trinitron CRT (13.9" viewable image size)
- B. 0.25mm aperture grille pitch
- C. Maximum Resolution: 1280 x 1024
- D. Front Panel Controls with on-screen display
- E. EPA Energy Star compliant

#### 2.2.2 17" Color SVGA Monitor

- A. 17" Trinitron CRT (16.0" viewable image size)
- B. 0.25mm aperture grille pitch
- C. Maximum Resolution: 1600 x 1200
- D. Front Panel Controls with on-screen display
- E. EPA Energy Star compliant

#### 2.2.3 21" Color SVGA Monitor

- A. 21" CRT (20" viewable image size)
- B. 0.25mm aperture grille pitch
- C. Maximum Resolution: 1600 x 1200
- D. Front Panel Controls with on-screen display
- E. EPA Energy Star compliant

### 2.3 Network Adapters/Cards

#### 2.3.1 Etherlink III LAN PCMCIA Cards for notebooks (or approved equal)

#### 2.3.2 Etherlink III PCI Combo Card for desktop computers (or approved equal)

### 2.4 Modems





- 2.4.1 Internal modem card
    - A. 56k bps data (V.34)
    - B. 14,400 bps send and receive Class 1 and 2 fax
    - C. Up to 115,200 bps maximum throughput with V.42bis
    - D. 16550 Buffered UART
  - 2.4.2 External Modem
    - A. 56k bps data (V.34)
    - B. 14,400 bps send and receive Class 1 and 2 fax
    - C. Up to 115,200 bps maximum throughput with V.42bis
    - D. 16550 Buffered UART
  - 2.4.3 PCMCIA Modem
    - A. 56k bps data (V.34)
    - B. 14,400 bps send and receive Class 1 and 2 fax
    - C. Up to 230,400 bps maximum throughput with V.42bis
    - D. 16550 UART
  - 2.5 Printers
    - 2.5.1 HP 6MP or approved equal
    - 2.5.2 HP 6Si/MX or approved equal
    - 2.5.3 OCE' 9400 or approved equal. Multi-use large format engineering printing, copying and scanning system.
  - 2.6 Voltage Surge Protection
    - A. Lifetime Warranty
    - B. Lifetime Equipment Protection of \$10,000
    - C. 7 outlets
    - D. Data/fax phone line protection
  - 2.7 Mouse: microsoft version 2.0 ergonomic mouse or approved equal
  - 2.8 Keyboard: 101 Key enhanced keyboard. Adesso or approved equal
- END OF SECTION 11111



## 11000 - Equipment

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### SECTION 11181

#### TELEMETRY EQUIPMENT

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of Telemetry Equipment. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS
  - 2.1 Telemetry Equipment
    - 2.1.1 Contractor shall furnish and install complete the items as required by the Contracting Officer. All equipment shall meet the following requirements:
    - 2.1.2 The equipment shall be similar to the model number of the existing equipment or as directed by the Contracting Officer complete with the Standard accessories except as otherwise directed for the particular item. Extra accessories, when required, will be specified or hereinafter described.
- 3.0 EXECUTION:
  - 3.0.1 Surface Conditions:
    - 3.0.1.1 Inspection:
      - 1. Prior to work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where fabrication and installation of the work of this Section may properly commence.
      - 2. Make all required measurements in the field to insure proper and adequate fit of items.
    - 3.0.1.2 Discrepancies:
      - 1. In the event of discrepancy, immediately notify the Contracting Officer
      - 2. Do not proceed with fabrication or installation in areas of discrepancy until all such discrepancies have been fully recovered.
    - 3.0.1.3 Guarantee
      - 1. The contractor shall guarantee all work performed and materials by him to be free of all defects and shall repair and/or replace any defective materials or equipment, free of cost for a period of one (1) year from date of final acceptance.
  - 3.0.2 Erection:
    - 3.0.2.1 Coordination:
      - 1. Coordinate installation schedule with the schedules of other trades to insure orderly and timely progress of the total work.



END OF SECTION 11181



## 11000 - Equipment

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### SECTION 11191

#### SECURITY EQUIPMENT

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of Security Equipment. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS
  - 2.1 Security Equipment
    - 2.1.1 Contractor shall furnish and install complete the items as required by the Contracting Officer. All equipment shall meet the following requirements:
    - 2.1.2 The equipment shall be similar to the model number of the existing equipment or as directed by the Contracting Officer complete with the Standard accessories except as otherwise directed for the particular item. Extra accessories, when required, will be specified or hereinafter described.
  - 2.2 Holding Cell
    - 2.2.1 Contractor shall furnish all the materials, appliances necessary and required to completely manufacture a temporary detention cell with ¼" diameter woven steel rod walls and door with solid ceiling panels.
    - 2.2.2 Materials:
      - 1. Holding Cell shall consist of a Vantage-Wall cell front (as manufactured by Kane Manufacturing Corporation), all sides, back and hinged door, solid ceiling panels and all fittings needed for a complete installation.
- 3.0 EXECUTION:
  - 3.0.1 Surface Conditions:
    - 3.0.1.1 Inspection:
      - 1. Prior to work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where fabrication and installation of the work of this Section may properly commence.
      - 2. Make all required measurements in the field to insure proper and adequate fit of items.
    - 3.0.1.2 iscrepancies:
      - 1. In the event of discrepancy, immediately notify the Contracting Officer
      - 2. Do not proceed with fabrication or installation in areas of discrepancy until all such discrepancies have been fully recovered.



## 11000 - Equipment

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### 3.0.1.3 Guarantee

1. The contractor shall guarantee all work performed and materials by him to be free of all defects and shall repair and/or replace any defective materials or equipment, free of cost for a period of one (1) year from date of final acceptance.

### 3.0.2 Erection:

#### 3.0.2.1 Coordination:

1. Coordinate installation schedule with the schedules of other trades to insure orderly and timely progress of the total work.
2. Placement of equipment relating to floor groove lines shall be coordinated with flooring contractor.

END OF SECTION 11191



## 11000 - Equipment

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### SECTION 11400

#### FOOD SERVICE EQUIPMENT

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of Food Service Equipment. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS
  - 2.1 Refrigeration Equipment, General
    - 2.1.1 Contractor shall furnish and install complete the items as required by the Contracting Officer. All equipment shall meet the following requirements:
    - 2.1.2 The equipment shall be similar to the model number of the existing equipment or as directed by the Contracting Officer complete with the Standard accessories except as otherwise directed for the particular item. Extra accessories, when required, will be specified or hereinafter described.
    - 2.1.3 The refrigeration equipment shall be serviced for one year by an authorized agency of the manufacturer. Finish of the equipment shall be first class in every respect. Equipment shall be of rigid construction, quiet in operation and shall be free from objectionable vibration. All parts requiring adjustment or lubrication shall be readily accessible. Machine parts shall be accurately made to insure complete interchangeability and parts subject to wear shall be readily replaceable. All parts of equipment subject to corrosion shall be protected.
    - 2.1.4 Refrigeration equipment shall comply with the requirements of the Underwriters Laboratories, Inc., and meet the approval of the Underwriter's Lab (UL), National Sanitary Foundation (NSF). Refrigerant shall be 134a or environmentally approved refrigerant.
    - 2.1.5 All materials construction of stainless steel shall be polished to a satin finish. All portions of the machine made of sheet metal or castings shall be finished in the manufacturer's standard finish.
    - 2.1.6 Cuts and complete description for all mechanical equipment shall be submitted for the Contracting Officer's approval together with motor data.
  - 2.2 Walk-In Refrigerators, Freezer, and Refrigerator/Freezers, Prefabricated, with Shelving
    - 2.2.1 General

Walk-in units shall be prefabricated, all metal clad unit of sectional construction, designed for easy, accurate and sealed field assembly. Nominal size shall be as shown. Unit shall have one door, one or more side mounted refrigeration units designed to maintain an interior temperature as specified, and be installed complete with shelving. Air flow exhaust shall be provided. Unit shall be UL approved. No wood shall be permitted anywhere in the construction.
    - 2.2.2 Section Construction



### 2.2.2.1 Design

Sections shall be made in 23" or multiple widths thereof, each having precision formed interior and exterior metal wall pans, gauge checked for uniformity. Interior rigid urethane insulation shall be tightly bonded to wall pans so as to form a strong structural wall member. Section edges shall be of tongue and groove design for correct panel alignment on assembly and be provided with plastic gaskets on exterior and interior edges to assure an air-tight, vapor proof join without use of caulking agents or sealants. All section joints of final assembly shall show fully and uniformly squeezed gaskets. All sections including door shall be 4" thick. Overall height shall be 8' 6" unless otherwise specified on work request.

### 2.2.2.2 Insulation

Insulation shall be rigid, Freon frothed "foamed-in-place" polyurethane with a thermal conductivity (K) of not more than 0.14 BTU/hr. (sq./ ft/) (degrees F/in). Insulation shall be rated as self-extinguishing according to ASTM-D-1962 test and have a UL flame spread rating of 25 according to ASTM-D (UL Tunnel Test). Submit affidavit attesting to compliance.

### 2.2.2.3 Panel Facing

a. Interior and exterior panel facing roof section shall be .040" (min.) smooth aluminum.

b. Wall Sections

Exterior panel facing of all wall sections, except door section shall be .040" (min.) stucco embossed aluminum. Interior panel facing all wall sections, except door section shall be .040" (min.) smooth aluminum.

c. Door Section

Interior and exterior panel facing of entire door section shall be 20 gauge smooth (min.) stainless steel with line polish.

d. Floor Section

Interior floor shall be 16 gauge (min.) smooth stainless steel. Exterior of floor section shall be .040" (min.) smooth aluminum.

### 2.2.2.4 Section Fasteners

Walk-in unit sections shall be assembled with cam-action, hook-and-pin type locking arms capable of maintaining correct section alignment and tight joints under all service conditions. Section fasteners shall be no more than 32" apart, except if fastener-to-fastener steel connecting straps through the sections are employed, in which case a 48" separation will be permitted. Section locks shall be actuated from inside through access ports in wall panel by means of locking wrench which shall be supplied as part of installations. Each access port will be equipped with an easily removable and replaceable seal plug.

### 2.2.2.5 Door Section

a. Design: Door Section entrance opening shall be not less than 34" wide and 78" high. Door shall be of the in fitting flush mounted type with full structural or other approved framing. Provide portable metal roll-in ramp for units 12' in depth or deeper. Ramp shall be of reinforced



## 11000 - Equipment

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stainless steel construction with incline 8 degrees or less. Door shall be mounted on rise type hinges.

- b. Hardware: All door hardware shall be line polished aluminum or chrome plated brass. Door shall have three heavy duty hinges of the self-closing type with stainless steel pivot pins and spring, and nylon cam bearing. Door latch shall be of the heavy duty, safety inside release type designed to prevent entrapment of persons inside. Refrigerator latch shall have integral cylinder type lock supplied with 3 keys and tags. Door section shall contain a compact foot treadle to facilitate easy opening of door with foot pressure. Door shall have positive action door closer.
- c. Door Gaskets: Door gaskets shall be approved plastic, resistant to temperature extremes, oils, fats, water and sunlight, and shall be easily replaceable. Door gasket shall be mounted on top and sides of door and shall be of the magnetic core type, forming a positive air-tight seal when door is closed. Magnetic pull-in strip on door jamb shall be stainless steel. Bottom edge of door shall contain an adjustable rubber wiper gasket.
- d. Door Jamb Anti-Sweat Heaters: Anti-sweat heater wires shall be concealed in door jamb on all four sides. Heater shall have sufficient heating power to prevent condensation or frost formation at these locations under all service conditions.
- e. Interior Lighting: Door section shall be provided with incandescent vapor-proof lamps on interior controlled by an exterior mounted light switch with pilot light.

### 2.2.3 Refrigeration Unit

#### 2.2.3.1 General

Refrigeration Unit shall be self-contained, easily replaceable, factory pre-piped and pre-wired unit of the walk-in unit manufacturer's standard recommended horsepower and manufacture. System shall be designed for use with refrigerant 134a, fully automatic in operation and complying with this Specification.

#### 2.2.3.2 Condensing Unit

All components of the condensing unit shall be of the semi-hermetic, air cooled type mounted on approved vibration absorbers. The condenser shall be a semi-static type, provided with a perforated aluminum protective housing (16 gauge min.), easily removable for servicing unit at site. Provide housing with louvered bottom, or otherwise approved equal, for ventilation.

#### 2.2.3.3 Evaporator

The forced-air evaporator shall have plastic coated coils and be designed so that cooled air is discharged parallel to ceiling. Air circulation motors, multi-fin and tube type coil, and heat exchanger shall be assembled within a protective housing.

#### 2.2.3.4 Defrost System

The condensing unit shall be equipped with an automatic cycling defrost timer system for the evaporator which shall include provision for connection of heater wires from the condensate pan and tubing to prevent freezing of condensate during defrost. These heater wires shall energize only during the defrost cycle.





Condensate piping shall exit from unit as close to evaporator as possible with a minimum slope of 1/2 inch per foot. Contractor shall furnish and install complete condensate removal system and be responsible for its proper operation and code compliance. Condensate shall be conducted to floor drain with copper pipe, or approved equal, run exposed and secured to box wall. Provide check flap at external end of condensate drain. Automatic defrost system shall be an integral part of the cooler and be a type "L" hot gas, Bally Electric, Bunham-Bush hot gas or equal as approved by the Corpus Christi Army Depot.

### 2.2.3.5 Refrigeration Unit Support

Saddle type side mounted refrigeration unit shall be supported in a steel structure designed to eliminate all weight loading of wall panels as follows:

- a. Compressor and evaporator shall each be supported in close fitting 1.5" (min.) angle iron frames.
- b. Each angle frame shall be securely bolted to 2' 2" (min.) angle iron vertical legs supported from the horizontal angles.
- c. No attachment of unit support structure to refrigerator panels permitted.
- d. Condensing unit support shall provide at least 6' 9" of clearance space underneath measured from finished floor unless otherwise specified. Diagonal bracing interfering with clearing space is not permitted.
- e. Support structure to be given 2 coats of aluminum rust resistant enamel.

### 2.2.4 Thermometer

Furnish and install on exterior wall a 6" surface mounted dial or digital remote thermometer, with flexible tubing and bulb with bulb supporting bracket extending to interior of unit. Tubing shall be removable for replacement and shall be installed as direct as possible without coiling. The thermometer shall be calibrated for temperature reading between minus 40 degrees F and bulb 110 degrees F. The thermometer shall be chrome-plated brass case, 1 mercury activated with armored stainless steel tubing and stainless steel bulb 12" long, similar to Weksler No. 60-MBI-WR, Moeller No. D-15, Taylor Instrument Co., or other approved equal.

### 2.2.5 Temperature Rise Alarm System

Furnish and install on the exterior of the unit a signal device to indicate an above average temperature rise. The controller or signal device shall be similar to Minneapolis-Honeywell, Model T-414A which shall make contact on the rise of the temperature. Controller shall consist of 1/2" x 1/4" liquid filled, remote bulb with 5 feet of copper tubing, and shall operate on 120-volt, single phase circuit (range shall be -25 degrees F to +85 degrees F).

Unit shall be mounted on front wall of each unit with bulb fastened to the inside lining with stainless steel perforated guard, straps and screws.

Opening in insulated wall of unit where capillary tube passes through shall be caulked tight.

The housing for the controller shall have a knock-out in the back to allow for electric connection by others.

### 2.2.6 Shelving Units



## 11000 - Equipment

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### 2.2.6.1 General

Each Walk-In unit shall be provided with four tiers of shelving around interior walls, except under unit cooler where three tiers of shelving will be provided. The sizes and location of shelving shall be to match the existing or as directed by the Contracting Officer. Units must have NSF approval.

### 2.2.6.2 Material

Shelving units shall be of 16 gauge (min.) type 302 or 304 stainless steel construction with all parts line polished.

### 2.2.6.3 Construction

Shelves shall be die-formed, channel shape in section, approx. 1.25" deep, with multiple slots for air circulation. Sheet metal shall be folded back on itself at vertical edges to produce a double thickness of material at periphery. Corners shall be welded and ground smooth and all raw edges deburred. Post mounting members at shelf corners shall be equipped with set screws to allow setting shelves at any desired spacing. Posts shall be 6' long (except under cooler), 1.25" diameter (min.) with 2.5" (min.) flanged feet at the bottom and press fit ball glides at the top. Unit shall be of sanitary, crevice-free, vermin proof construction.

### 2.2.7 Floor Racking

Floor Racking shall be of the grease proof, bacteria resistant composition of rubber type furnished in individual interlocking tiles. Entire center area (between shelving) shall be covered. Matting shall be approximately .75" thick with beveled edge section installed at entry.

### 2.2.8 Electrical Requirements

Compressor motor complete with magnetic starter and approve thermal protection shall be of the manufacturer's recommended horsepower, 208 volts, 60 HZ, 3 phase. Cooling unit, including blower motor, timer, solenoid valve, defrost unit and door heater shall be 120 volts, 60HZ, single phase, 375 watts approximately.

### 2.2.9 Information Plate

Each walk-in unit shall have a plate or plates located in a readily accessible location showing the manufacturer's name and address, model, serial number of cabinet, condensing unit, manufacturer's model and serial number, electrical characteristics, including horsepower, voltage, current, cycles, and phase, the amount and type of refrigerant and factory test pressures, and the UL label. Removal of manufacturer's plate or identification label is forbidden. A nameplate with manufacturer's name shall also be firmly fixed in a conspicuous place in front of refrigerator. Installation shall carry the seal of both UL and NSF to indicate compliance.

### 2.2.10 Installation Requirements

#### 2.2.10.1 Erection Area

Bottom of refrigerator shall rest on finished floor, unless required. Installer shall provide a screed coat or other approved method to attain a fully leveled base under unit. Installer shall submit an affidavit attesting to the fact that the area upon which the refrigerator was erected is walk level as witnessed by use of a six foot level.

#### 2.2.10.2 Erection Certificate



The erection of the unit shall be under the supervision of a manufacturer's regular factory representative who shall submit an affidavit at the conclusion of the erection attesting to the fact that the installation meets all factory quality standards.

### 2.2.10.3 Caulking at Floor

Exterior edges of unit which come in contact with floor shall be evenly and completely caulked with approved caulking material.

### 2.2.11 Electrical Connections

#### 2.2.11.1 This contractor shall make complete electrical connections of the following:

- a. Condensate defrost system.
- b. Light, switch, and door jamb heater wiring internal to door section.
- c. Drain heater (freezer, only)
- d. Separate disconnects (refrigerator / freezers, only)

#### 2.2.11.2 Electrical contractor shall connect the following to electrical service junction boxes:

- a. Refrigeration unit.
- b. Door section heater, light and switch.
- c. Temperature rise audio and visual alarm system.
- d. Drain heater (freezer, only)

### 2.2.12 Warranty

The manufacturer shall warrant that the installed unit and all related accessories are free from defects in material or workmanship under normal use and service, and shall be obligated to repair or replace any part of this equipment which proves defective within the period of at least five years from the date of acceptance by the Corpus Christi Army Depot. Contractor will furnish and warranty/service contracts in accordance with this specification.

### 2.2.13 Shop Drawings / Operating Instructions / Parts Manual

Shop drawings and factory cuts of refrigeration unit, defrost unit, compressor support, shelving and controls together with wiring diagram, schematic diagram with sizes of all piping, etc., for installation shall be submitted in quintuplicate for approval of the Contracting Officer before erection.

Provide complete operating instruction/parts manual with electrical schematic installation.

## 2.3 Refrigerators, Freezers, Milk Storage Cabinets and Compressor Units

### 2.3.1 Refrigeration Unit

Units shall be of the air-cooled hermetically sealed type unless otherwise directed, shall be complete with compressor, condensing unit, cooling coil, evaporator, starter, liquid line, metering device accumulator, dryer, strainer, heat exchange, thermostatic expansion valve or temperature control, vibration dampers, approved pressure switch, suction line, etc.



## 11000 - Equipment

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The unit shall be supplied with the necessary charge of refrigerant to maintain an average temperature of +35 degrees F in the food compartment of the refrigerator; 0 degrees F in Freezer, with a room temperature of 100 degrees F and the unit operating no more than 16 hours in each 24 hours. The use of the box shall be considered heavy. The refrigerator unit shall be installed to meet the requirements and the rules and regulations of any applicable code or statute of the State of Florida.

### 2.3.2 Condensing Unit

The Condensing Unit shall be of the hermetically sealed type and shall consist of a motor, compressor, receiver, condenser, condenser fan, fan motor and high-low pressure control. The pressure control shall be completely wired and installed.

### 2.3.3 Cooling Unit (Plate Type) (Freezer)

The cooling coils for the freezer shall be of the plate type unless otherwise directed. Plates shall be smooth, sanitary construction designed for low temperature requirements, easily cleaned and free of pockets or crevices where dirt may collect. Plates shall be constructed of aluminum or stainless steel on upper surface, bottom surface may be made of zinc metalized plate; baked enamel on steel will not be accepted.

### 2.3.4 Automatic Defrost Unit

When blower type cooling unit is installed in a reach-in freezer it shall be equipped with an automatic hot gas defrost unit similar to the Thermobank type and be of the size recommended by the manufacturer. The unit shall be completely installed and wired by the Contractor ready for final connection by the electrical contractor. Provision shall be made to carry off condensate from top of box on the event of an evaporator heater failure.

### 2.3.6 Unit Cooler, Blower Type

When blower unit is specified the motor shall be of manufacturers recommend H.P. designed for continuous operation, and may be of the shaded pole type. The fan motor shall be connected from compressor compartment by means of a two (2) wire rubber covered cord: wire shall be run in metal molding, conduit or Greenfield. Where the wire penetrates the inside lining of refrigerator, an approved waterproof sleeve shall be provided. The unit shall be provided with an enclosed stainless steel pan type electric evaporator, completely wired into the electric system.

### 2.3.7 Vibration Dampers

The legs or base of the compressor unit shall be mounted on four vibration dampers, or the unit shall have internal type dampers.

### 2.3.8 Electrical Requirements

2.3.8.1 All motors shall be of the capacitor type; sizes as recommended by the manufacturer for up to 3/4 H.P., 120 volts, single phase. 3/4 H.P. and over shall be 208 volts, single phase; all provided with automatic overload protection. Provide an outlet box in motor compressor space and furnish and install all wiring from blower motor, heater cable and light and terminate in this box. Twist-lock plug and two wire cord may be used to connect compressor to receptacle installed in compressor space. Provide rear mounted junction box for electrical connection.

2.3.8.2 Contractor shall furnish and install 120 volt or 208 volt, single phase circuit as required, from source of supply to a flush wall disconnect switch and from switch to a flush wall outlet.



Box shall be complete with extension ring and cover. All wiring between outlet box in wall and outlet box on refrigerator shall be run in 3/4 flexible liquid-tight conduit of proper minimum length.

### 2.4 Refrigerator ( Reach-In Type)

#### 2.4.1 General

All refrigerators herein mentioned to be of a commercial type, listed by Underwriters' Laboratories and the National Sanitation Foundation to insure the maximum in safety, performance and sanitation. They are to carry the appropriate seals to indicate compliance. To avoid possibility of persons being accidentally trapped inside units, all cabinets shall include doors than can be opened from inside with a pressure of 10 lbs. or less.

2.4.2 The manufacturer of the equipment shall be an established one who has manufactured commercial equipment of this type for a period of not less than ten (10) years on a production line basis employing modern methods. The manufacturer shall have a complete up-to-date laboratory and testing equipment with competent engineering and quality-control personnel to insure a quality products.

2.4.3 All refrigerators shall be furnished with instruction manuals, packaged with each item. This booklet is to have pertinent information required for installation, operation and proper maintenance.

2.4.4 The manufacturer shall guarantee the equipment against all defective components and workmanship for a period of one year from date of acceptance.

In addition, all hermetically or semi-hermetically sealed compressor units for refrigerators, freezers, ice cream cabinets, dessert cabinets, cold pans, water coolers, or any other equipment mechanically refrigerated, shall have a five-year warranty. This warranty shall consist of replacing the hermetically or semi-hermetically sealed compressor unit if it shall become defective within five (5) years from date of acceptance. It shall be replaced free of charge, by the manufacturer, to the Corpus Christi Army Depot exclusive of transportation and labor charges. The warranty shall be delivered to the Contracting Officer, prior to final acceptance and payment for this equipment.

2.4.5 The Contractor shall include installation, start up and service for a one-year period from the date of acceptance.

Refrigerator service contractor shall be subject to approval by the Contracting Officer for the particular building for which service is to be rendered and a seal shall be permanently affixed indicating name, address and emergency telephone number of the service company.

2.4.6 In the event that a contractor submits for approval an item other than the model specified, he shall furnish a complete set of specifications, detail drawings and photographs indicating that the substitution is equal in all respects to the specified model and be capable of all functions of the specified item. Evidence of satisfactory commercial/institutional use of the submitted item is also required. If this information is not furnished or if the substitution is disapproved, the original specifications without the expressed consent of the proper authorities (Contracting Officer) will be deemed cause for the rejection of the items furnished.

#### 2.4.7 Material

All materials shall be tested and approved by the National Sanitation Foundation Testing Laboratories (N.S.F.) They shall be odorless, nontoxic and resistant to fungus, rot and vermin. No wood or wood products are to be used whatsoever, due its inability to resist moisture, fungus and termites.



## 11000 - Equipment

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### 2.4.8 Cabinet Construction

Cabinet to be framed and formed entirely of metal using all welded and sealed construction. Entire cabinet to be degreased, jig assembled and insulated with polyurethane, foamed in place, to provide maximum vapor barrier, rigidity, strength and insulation efficiencies. Type of metal and finish to be similar to existing or as directed by the Contracting Officer.

2.4.8.1 Legs: Unless otherwise specified all models shall be furnished with sturdy 6" high adjustable, removable, sanitary, stainless steel legs. Single and two section cabinets (4) legs. They are to be of stainless steel construction approved by the National Sanitary Foundation. They shall be adjustable with a minimum of bearing on floor surface for ease of cleaning. Legs to allow a minimum of 6" unobstructed height under cabinet. They shall not have any exposed threads or unnecessary embellishments. Each leg shall be easily bolted to the base (thread gusset) with corrosion resistant Hex.Hd. machine bolts.

2.4.8.2 Exterior: Doors, front and sides to be stainless steel with line polish finish.

Exterior top, bottom and rear to be of heavy gauge galvanized steel, aluminum, or baked enamel.

Materials:

Stainless Steel: Shall be #20 gauge, type 304, with #4 finish.

Aluminum: #18 gauge, type 300-H14, corrosion resistant, natural finish.

Steel enamel finish: #20 gauge cold rolled steel, especially prepared for enamel finish.

2.4.8.3 Interior: Lining to be either polished 20 gauge stainless steel, .040 aluminum or approved plastic and shall meet N.S.F. Standard No. 7 requirements in regard to flush, smooth readily cleanable interiors. Interior to be sanitary covered corner, vapor tight construction with 5/16" radius bends. Interior bottom to be one piece with non-spill front to prevent interior spillage from contaminating door gaskets or cabinet face.

2.4.8.4 Insulation - All Models: All cabinets and all doors to be insulated with a minimum of 2" thick extra-rigid, self extinguishing polyurethane insulation, foamed in place.

Manufacturer shall certify that insulation be foamed in place to completely fill voids and create a permanent bond between inner and outer panels, and to certify that insulation has a test density of 2.5 lbs./cu. ft., a vapor transmission of less than 3 perms/inch, a compressive strength of at least 25 lbs./sq. inch and a K-factor of at least .14. Pre-foamed or pre-fabricated blocks or sheet of polyurethane are not acceptable as due to its inability to meet the foamed in place qualifications.

2.4.9 Door Openings, Mullions and Breaker Strips, Etc.

All door openings to have full perimeter high impact vinyl or styrene breaker strips suitable for low temperature use.

2.4.9.1 Strips to have built-in vapor tight raceway for all interior wiring. Outside breaker pieces to be removable to allow inspection or wiring, etc. All opening are to be provided anti-condensation heater with "on-off" control located on instrument panel.

2.4.9.2 Doors - Number and size of doors to be as model specified.



All metal 20GA 18-8 polished stainless steel face with full perimeter stainless steel raised edges and safety guard or rub rails.

Silent finger-tip action self-closing doors full face type, but designed to remain stationary when open 90 degrees or more.

Doors to swing within confines of cabinet proper to allow butting or banking with adjacent equipment.

Door liner or inside pans to be one piece, die formed, fabricated of the same metal as interior cabinet lining.

Inner and outer doors pans to be completely isolated from each other by means of a hard vinyl thermo-breaker integral cylindrical lock as standard. All locks keyed alike.

### 2.4.9.3 Door Gaskets

Magnetic: Gaskets are to be one piece magnetic, odorless, non-toxic, sure-seal, formed vinyl. Open corners, open miters or open joints not acceptable. Gasket is to be keyed into hard, vinyl thermo-breaker retaining frame. Gasket to have 100% retention around entire perimeter of door without employing screw, clips or other fasteners. Gaskets are to be easily removable for replacement.

### 2.4.9.4 Hardware

Hinges shall be heavy duty, self-closing, semi-concealed, four way adjustable bronze, chrome plated type or stainless steel with stainless steel pivots and nylon bearings.

Handle - All handles to be heavy duty stainless steel, chrome plated brass or aluminum alloy complete with internal cylinder locks (keyed alike). All hinges and handles to be under warranty for a period of 5 years from date of shipping from factory.

NOTE: All keys shall be chrome plated brass. A total of six (6) keys shall be provided. They shall each have an aluminum tag stamped with the letter "Ref" (for Refrigerator).

### 2.4.10 Machine Compartment

Machine compartment is to be located on cabinet top. It is to be the full length and depth of the cabinet and enclosed on front and both ends by removable 18-8 stainless steel or aluminum louvered grilles similar in appearance to cabinet design.

Stainless steel or aluminum louvers are to be formed in such a manner to allow full ventilation yet restrict the visibility of all components located behind the same.

Machine compartment to contain illuminated control panel and complete refrigeration assembly including all components.

All grilles and structural supports shall be readily removable for low clearance installation areas.

### 2.4.11 Control Panel

One illuminated control panel to be provided on each unit. All panels are to be clearly marked in a permanent fashion.

### 2.4.12 Refrigerator or Freezer Control Panel

To include visual internal high temperature warning device with red light which automatically flashes upon deviation from preset design temperature and interior temperature indicator (thermometer) which





## 11000 - Equipment

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reads exact inside temperature, visual power failure warning signal, air filter light, dew point compensation control and automatic electric adjustable thermostat control. Thermometer shall be 2-1/2" diameter, dial or digital type.

### 2.4.13 Refrigeration Unit Assembly

The entire refrigeration system, compressor, condenser, evaporator coil, diffuser plenum chamber, motors, fans, filter, condensation evaporator, controls and control panel shall be fabricated and assembled as a self-contained integral power pack or cabinet top which can be easily removed and replaced if required for ease of installation in minimum clearance locations.

Removing or remounting plenum chamber and assembly shall not require disconnecting, evacuating, recharging or disturbing the refrigeration system.

### 2.4.14 Complete diffuse plenum chamber and assembly shall be mounted above the interior of the cabinet in the machinery compartment out of the product zone, and shall be of same material as interior lining.

Access to plenum air distribution system shall be readily obtained by removal of required panels without the use of tools.

The full flow forced air distribution system shall be readily obtained be designed for maximum efficiency. The air shall be pulled in at the top of the ceiling above the product zone and forced through the evaporator coil and filter, then evenly divided and diverted to both sides of the cabinet and discharges down along the side walls to insure maximum circulation and even temperature throughout the entire interior, with minimum velocity, for maximum product preservation.

Those parts of the diffuser plenum in the machinery compartment are to be completely insulated and sealed with foamed-in-place polyurethane as indicated.

Fan motor or motors shall be noiseless, totally enclosed, shaded pole, lifetime lubricated type with built-in high impedance protection. Motors to be for operation in temperatures ranging from +120 degrees F to -40 degrees F. Fan blade or blades to be of aluminum alloy.

Fans or motors to be mounted to prevent any possible vibration, noise and fully protected from interior spillage.

### 2.4.15 Lighting - Automatic

Each refrigerator or freezer to be equipped with interior recessed lighting. Receptacle bulb, etc. to be located out of the product zone and recessed into interior ceiling of unit and completely shielded and protected with a high-impact resistant, translucent diffuser for maximum light and protection from contact or bulb breakage.

One (1) light assembly required in one and two section units.

All light bulbs to be readily replaceable. Light switch is to be provided at each door opening and shall operate automatically by opening or closing any door. Light or lights to be extinguished only if all doors are in a closed position. Bulbs must be of the 120 volt rating type.

### 2.4.16 Interior Accessories

Refrigerators, Freezers, Dual & Multi-Temperature Units - All interiors to be multi-purpose and interchangeable. They shall be designed to accommodate standard anodized aluminum shelving, stainless steel rod shelving, tray and pan slides, roll out drawers or any combination of the same. All





to be readily installed or changed in the field. None of the aforementioned shall required factory installation.

### 2.4.16.1 Shelves

Each section of the refrigerator or freezer shall be provided with 18" x 26" pans in the amount as directed by the Contracting Officer.

### 2.4.16.2 Tray Slide Stainless Steel

Each section of refrigerator shall be furnished with #16 gauge stainless steel angles, spaced on 2" centers to suit 18" x 26" pans supported on the bottom.

### 2.4.16.3 Pilasters

Shelf and Interior Accessory Support: All interiors to be furnished with 16GA, pilasters. They shall be readily removable for cleaning by snapping off. They shall be capable of being replaced in position in the same manner. The pilaster shall be channel shaped and to have a series of holes on 2" centers along its entire length.

### 2.4.17 Information Plate

Each refrigerator shall have a plate or plates located in a readily accessible location showing the manufacturer's name and address, model, serial number, electrical characteristics, including voltage, current cycles, amps, and phase, the amount and type of refrigerant and factory test pressures, and the UL Label. Removal of manufacturer's plate or identification label is forbidden.

Each cabinet shall carry the seal of both the UL and N.S.F. to indicate compliance.

### 2.5 Refrigerator (Roll-In Type) with Racks

Refrigerators shall be of the size, type and Model No. specified by the Contracting Officer and shall be similar to reach-in refrigerators except case shall be designed for housing portable racks, carrying 18" x 26" pans in the amount as directed by the Contracting Officer.

Bottom of refrigerator shall be set on floor. The bottom shall be of the same material as the lining of box, insulated and provided with ramp or tracks to permit entry of portable racks.

Portable angle racks shall be designed specially to fit refrigerator and use full height of cabinet. The racks shall be constructed of aluminum alloy throughout and consist of 1-1/2" shelf angles, on 3" centers, welded or riveted to outer frame and be mounted on four (4) recessed 5" diameter swivel ball bearing wheels with replaceable neoprene tires. Two of the wheels (on 18" side) shall be equipped with locks.

### 2.6 Freezer (Reach-In Type)

The freezer shall be of the size, type and model number to match the existing or as directed by the Contracting Officer. The construction, finish and electric requirement shall be similar to those of commercial refrigerators, refrigerating unit shall be of the blower type equipped with hot gas Thermo bank type Automatic defrost. The freezer shall be provided with legs, thermometer, name place, locks (same combination as refrigerators) as specified for refrigerators.

### 2.7 Freezer (Roll-Type) with Racks



## 11000 - Equipment

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Freezers shall be of the size, type and Model No. to match the existing or as directed by the Contracting Officer and shall be similar to reach-in freezers except case shall be designed for housing portable racks, carrying 18" x 26" pans in the amount directed by the Contracting Officer.

Bottom of freezer shall be set on floor. The bottom shall be of the same material as the lining of box, insulated and provided with ramp or tracks to permit entry of portable racks.

Portable angle racks shall be designed specially to fit freezer and use full height of cabinet. The racks shall be constructed of aluminum alloy throughout and consist of 1-1/2" shelf angles, on 3" centers, welded or riveted to outer frame and be mounted on four (4) recessed 5" diameter swivel ball bearing wheels with replaceable neoprene tires. Two of the wheels (on 18" side) shall be equipped with locks.

### 2.8 Combination Refrigerator and Freezer (Reach-In Type)

2.8.1 The combination refrigerator and freezer shall be of the size, type and model number to match the existing or as directed by the Contracting Officer, and shall comply with specifications for Reach-In Refrigerators and Freezers.

2.8.2 Provide separate refrigeration units and outlet boxes with 3/4" knockout in the compressor space for each motor, and terminate all wiring therein as specified for refrigerators.

### 2.9 Refrigerated Cold Pan

#### 2.9.1 Refrigerating Unit

Refrigeration unit shall be as herein before specified. Operation shall be based on not more than 15 degrees F temperature differential between cold pan temperature of 32 degrees F and refrigerant temperature, with an ambient temperature of 100 degrees F. Compressor shall be provided with thermostatic expansion valve and shall be thermostatically controlled to operate between the temperatures of 32 degrees F and 36 degrees F of the inside pan of the cold pan.

#### 2.9.2 Cooling Coils or Cold Plates

Cooling coils or cold plates shall be furnished and installed as indicated on detail drawing and shall meet thermal requirements to control the temperature of the inside pan of cold pan between temperatures of 32 degrees F and 36 degrees F.

#### 2.9.3 Electric Requirements

2.9.3.1 This contractor shall furnish and install switch box including switch and signal light, on rear panel or pipe space. Outlet box on motor shall be tapped for 3/4" conduit.

2.9.3.2 Other contractor shall furnish and install a 120 volt, single phase circuit from the source of supply to switch box and connect switch and signal light to outlet box on compressor motor.

### 2.10 Milk Shake Machine

2.10.1 Machine shall be of the size, type and model number to match the existing or as directed by the Contracting Officer.

2.10.2 Unit shall be of stainless steel construction with refrigeration unit(s) designed to freeze milk shake mixture which is delivered to spigot(s) by internal pressurization pump(s). Machine shall have hot and cold water hose bib inlet connects and top mounted swing-spout faucet to facilitate reservoir cleaning.

2.10.3 Machine shall be mounted on four (4) heavy duty casters (two with locks) with polyurethane tires.



## 11000 - Equipment

- 2.10.4 Machine shall be designed to operate on 208 volts, three phase and be provided with eight (8) foot heavy duty four conductor (one grounding) line cord(s) with plug to match receptacle.
- 2.11 Refrigerated Milk Storage Cabinet (Commercial Type for Racked Container Storage)
- 2.11.1 The cabinet shall be of the size, design, material and construction to match the existing or as directed by the Contracting Officer.
- 2.11.2 The cabinet shall be mechanically refrigerated with hermetically sealed condensing unit and cooling coil or plate coil cooling unit as specified. The tubing shall be secured to the cabinet liner sides, back, front and top with stainless steel strips and filled on both sides by a commercially accepted conductive mastic for heat transfer purposes.
- 2.11.3 Both exterior shell and inner lining shall be of the material and gauge to match the existing or as directed by the Contracting Officer.. The cabinet shall be support on an angle frame bas with channels or gussets for caster supports. The interior bottom shall slope 1" toward cabinet back to prevent carton from tipping during self-service. Opening to be provided in back for ventilation of access to refrigeration unit.
- 2.11.4 The cabinet shall be equipped with 1-1/2' top "Upper Door" and "Drop Down" front door full width of cabinet. Door to be provided with locking mechanism with two brass master keys and tags.

NOTE: All cabinets shall have locks of the same combination.

Instruction plate made from .040" brass, measuring 3" x 5" black background, raised letters, chrome plate, shall be fastened to door front center.

Instructions to read:

MILK REFRIGERATION CABINET

INSTRUCTIONS FOR OPERATION AND CARE

1. Keep plugged into 120 volt, 60 cycle, AC receptacle continuously, except when cleaning.
2. Clean cabinet thorough inside and outside daily.
3. Lubricate caster every three months.

MANUFACTURED BY: DISTRIBUTOR:

NAME: NAME

REFRIGERANT -- Less than 5 lbs. of F-12.

- 2.11.4 Sides, bottom, back, front (except door), shall be insulated with not less than 1-1/2" urethane foamed in place insulation. Top shall be insulated with same type of insulation not less than 1-1/2" throughout panel section or 1" at seams. Metal liner surface next to insulation shall be sprayed with Type 3M sealer after all fabrication or fastening of tubing to liner walls has been completed. Both door surfaces in contact with insulation shall be sprayed with same sealer before assembly.
- 2.11 5 The refrigeration unit shall be hermetically sealed, capillary tube type, with fan cooled condenser, Freon 12 refrigerant, Tecumseh or equal. Provide (8) feet heavy duty three conductor (one grounding) line cord with Hubbell No. 5276 plug.



## 11000 - Equipment

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- 2.11.6 The wire racks are to be supplied with bottom and upright center partitions made from Type-302 stainless steel wire. Center partitions and one bottom rack shall be combined into one assembly. Outside frame of racks and two intermediate supports shall be made from 7/32" stainless wire., cross rods of 5/32" diameter spaced on 1" centers with each fourth or fifth cross wire made from 7/32" stainless wire. Height of center partition shall be as large as permitted by door opening.
- 2.11.7 Two swivel and two rigid casters with 3" ball-bearing wheels with polyurethane tires (and ball-bearing swivel) shall be assembled to each cabinet with 1/4" zinc plated hex head bolts and nuts with lock washers.
- 2.12 Cold Cart, Small
- 2.121 Cart shall be of the size, type and model number to match the existing or as directed by the Contracting Officer.
- 2.12.2 Unit shall be of stainless steel construction with foamed-in-place polyurethane insulation. Unit shall be mounted on four (4) heavy duty casters, two with locks.
- 2.12.3 Refrigeration unit shall be of the hermetically sealed type of the manufacturers standard horsepower of sufficient capacity to maintain individual milk shake containers at approximately +25 degrees F. Supply a total of twenty (20) aluminum trays to suit size of lowerated capacity(s).
- 2.12.4 Cart shall have integrally mounted dial thermometer in wall of cabinet covering at least a range of 0 degrees F to +120 degrees F.
- 2.12.5 Machine shall be designed for 120 volt single phase operation. Provide eight (8) foot heavy duty three conductor (one grounding) line cord with plug to match receptacle.
- 2.13 Cold Cart, Large
- 2.13.1 Cart shall be of the size, type and model number to match the existing or as directed by the Contracting Officer.
- 2.13.2 Unit shall be of stainless steel construction with foamed-in-place polyurethane insulation. Unit shall be mounted on four (4) heavy duty casters, two with locks.
- 2.13.3 Refrigeration unit shall be of the hermetically sealed type of the manufacturers standard horsepower of sufficient capacity to maintain individual milk shake containers at approximately +25 degrees F. Supply a total of thirty (30) aluminum trays to suit size of lowerated capacity(s).
- 2.13.4 Cart shall have integrally mounted dial thermometer in wall of cabinet covering at least a range of 0 degrees F to +120 degrees F.
- 2.13.5 Machine shall be designed for 120 volt single phase operation. Provide eight (8) foot heavy duty three conductor (one grounding) line cord with plug to match receptacle.
- 2.14 Ice Cream Cabinet
- 2.14.1 Cabinet shall be of the size, type and model number to match the existing or as directed by the Contracting Officer.
- 2.14.2 Cabinet shall be of baked white enamel on steel construction with top lift up covers. Unit shall have integrally mounted dial type thermometer in cabinet wall covering the -30 degrees F to +120 degrees F range. Insulation shall be of the foamed-in-place polyurethane type.



## 11000 - Equipment

- 2.14.3 Where sub-base is perforated, install a 1/4" galvanized wire mesh the full height of the sub-base and fasten to inside surface thereof so that cabinet will be rodent proof.
- 2.14.4 For locking all covers provide stainless steel frame as shown on detail, a C.P. brass lock and 3 keys with C.P. brass ring.
- 2.14.5 Refrigeration unit shall be of the hermetically sealed type, of the manufacturers standard horsepower designed for storage of individual ice cream servings.
- 2.14.6 Cabinet shall be designed to operate on 120 volt single phase and be equipped with eight (8) foot heavy duty three conductor (one grounding) line cord with plug to match receptacle.
- 2.15 Undercounter Refrigerator
- 2.15.1 Refrigerator shall be of the size, type and model number to match the existing or as directed by the Contracting Officer. The construction, finish and electric requirements shall be similar to those of commercial refrigerators, except where noted. Entire refrigerator shall be insulated with foamed-in-place polyurethane. The refrigerator shall comply with Par. .06 of this section, for warranties, etc.
- 2.15.2 Electric requirements: 120 volt single phase with eight (8) foot solid electrical connection by other contractor.
- 2.16 Ice Cream/Milk Cabinet
- 2.16.1 Refrigerator shall be of the size, type and model number to match the existing or as directed by the Contracting Officer.
- 2.16.2 Cabinet shall be of stainless steel construction with foamed-in-place polyurethane insulation. Unit shall be designed with two storage cavities, one for milk and one for ice cream.
- 2.16.3 Provide lift-up type doors with locking mechanism. Locks shall be provided with two (2) master keys with tags. Each cavity shall have integrally mounted thermometer in cabinet wall indicating interior temperature. Thermometer shall cover -10 degrees F to +120 degrees F range.
- 2.16.4 Refrigeration unit(s) shall be of the hermetically sealed type of the manufacturers standard horsepower. Electric requirements shall be 120 volt, single phase. Provide eight (8) foot heavy duty three conductor (one grounding) line cord with plug to match receptacle.
- 2.17 Refrigerated Base Table
- 2.17.1 Table shall have refrigerated base unit of the hermetically sealed type and of the model and capacity to match the existing or as directed by the Contracting Officer, complete with all accessories. Door swing shall be to hand to match the existing or as directed by the Contracting Officer.
- 2.17.2 Unit shall be designed for 120 volt single phase operation. Solid Electrical connection by other contractor. Compressor(s) shall be of the manufacturer's standard horsepower.
- 2.18 Heavy Duty Gas and Electric Heated Equipment - General
- 2.18.1 The contractor shall furnish and install the equipment complete, as directed by the Contracting Officer. All equipment listed in this section shall be furnished in accordance with the following requirements.
- 2.18.2 Where available, all gas heated equipment shall be provided with electric ignition. When electric ignition is not available safety type pilots will be furnished.



## 11000 - Equipment

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2.18.3 All cooking equipment under the exhaust hood shall be interlocked with the exhaust fan so the equipment cannot be used without the exhaust fan being on. This is done as follows: For pilot ignited equipment, the equipment shall be procured with a factory installed solenoid in the input gas line, downstream from the pilots, that shall be interlocked with the exhaust fan. For Gas Hot Plate, this contractor shall procure this unit without factory installed solenoid, but shall furnish and install a solenoid (ASCO 803A17-120V-60HZ) for interlocking the input gas line with the fan; place solenoid as close to the wall as possible.

For bake oven, if this unit is not available with electric ignition, the internal circulating oven fan(s) shall be locked with the hood exhaust fan. For electrically ignited equipment, the ignition shall be interlocked directly with exhaust fan.

2.18.4 The equipment shall be of the model number to match the existing or as directed by the Contracting Officer, complete with the standard accessories, except as otherwise noted. Extra accessories, when required will be requested by the Contracting Officer.

2.18.5 Equipment shall be thoroughly tested in the presence of a representative of the Contracting Officer and is subject to approval before same will be accepted.

2.18.6 Equipment, burners, valves, safety pilots and thermostats shall have "American Gas Association" approval. All electrically heated equipment shall comply with the requirements of the Underwriters Laboratory.

2.18.7 Cuts and complete description of all equipment shall be submitted in quintuplicate for the Contracting Officer's approval, before installation.

2.18.8 Safety Pilots

2.18.8.1 Safety Pilots shall be of the 100% safety type that will prevent the escape of unburned gases in the event of accidental pilot outage, and shut off gas to main burner and pilot. The safety pilot lighter button shall be located above the oven door and be easily accessible for lighting.

2.18.8.2 The Contractor shall consult with the Gas Company as to the type of gas to be furnished and shall arrange for inspection and adjustment of burners, nozzles, etc., of appliances, so that they will operate properly and safely with the type of gas supplied.

2.18.9 The finish shall be in the finish to match the existing unless otherwise directed by the Contracting Officer. All parts subject to corrosion shall be protected until ready for use.

2.18.10 All gas or electric fired equipment shall be properly insulated so that when fired at maximum heat no outside surfaces handles, etc., are sufficiently hot so as to produce burns when touched.

2.18.11 All equipment fixed in place requiring electrical input connections shall be provided with integral junction box in rear for solid electrical connection.

2.18.12 All electrically heated kitchen equipment shall be of the thermostatically temperature controlled type with fully sheathed heater elements designed to be easily serviced or replaced.

2.19 Range Heavy Duty (Gas)

Range shall be of the design, size and type to match the existing or as directed by the Contracting Officer, and shall set on 6" high adjustable stainless steel legs. All openings in base and vents in rear



shall be covered with 1/4" wire mesh. Range oven shall be provided with automatic pilot and thermostatic control. Provide with solenoid valve.

2.20 Range, Hot Top, Gas

The range shall be of the same manufacture type and model number to match the existing or as directed by the Contracting Officer, complete with all standard accessories except as otherwise noted. Extra accessories when required will be requested by the Contracting Officer. Provide solenoid valve as required.

2.21 Stock Pot Range

The range shall be of the same manufacture type and model number to match the existing or as directed by the Contracting Officer, complete with all standard accessories except if otherwise indicated. Provide unit with solenoid valve.

2.22 Gas Hot Plate

The hot plate shall similar to the existing model or as directed by the Contracting Officer and with legs cut so that top is 27" above floor; the bottom shelf shall be a minimum of 6" above floor. The legs shall be secured to the floor with 1/4" galvanized steel expansion bolts and lead shields. Provide and install gas line solenoid. Number of burners shall be as required.

2.23 Expando Unit (Gas)

The Expando Unit shall be of the size and design to match the existing or as directed by the Contracting Officer and shall be set on 6" high adj. stainless steel legs and screened.

2.24 Expando Unit (Electric)

The Expando Unit shall be similar to the existing model or as directed by the Contracting Officer. The unit shall be set in an angle stand mounted on adjustable tubular legs which shall be secured to the floor. The height of the angle stand shall be such that the working surface of the Expando Unit shall be 27" above the floor.

Frame: Shall be proper size to accommodate Expando Unit and shall match the existing model or as directed by the Contracting Officer. It shall be constructed of 1-1/2" x 1-1/2" x 12 ga. stainless steel angles and braced in all (4) corners by 6" x 6" x 12 ga. stainless steel gusset plates welded to angle frame. Sanitary bell shaped sockets shall be welded to frame in each corner.

Legs: Shall be made of 1-5/8" dia. x 16 ga. S.S. tubing inserted in sockets (aforementioned), and fixed in place with set screws.

Feet: Shall be provided for legs and these in turn shall be anchored to floor with stainless steel expansion bolts.

2.25 Deep Fat Fryer (Gas)

2.25.1 The fryer shall be of the design and size to match the existing or as directed by the Contracting Officer and shall match assembly of ranges, where required.

2.26 Elevated Ceramic Broiler (Gas)

2.26.1 The broiler shall be of the type and design to match the existing or as directed by the Contracting Officer.





## 11000 - Equipment

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- 2.26.2 The broiler shall have heavy oval pattern grid bars and removable ceramic broiler and shall be equipped with an easily operated raising and lowering device.
- 2.27 Griddle (Gas)
- 2.27.1 Griddle shall be of the type, size and design to match the existing or as directed by the Contracting Officer. Unit shall be gas fired with electric ignition.
- 2.27.2 Griddle shall have 0.75" thick high polished steel cooking surface with thermostatic controls. Provide lower shelf and adjustable leg stand. Install rear and side stainless steel splash protectors at least 12" in height to match the existing conditions.
- 2.27.3 Griddle shall be provided with rear mounted junction box for solid connection of electric ignition by electrical contractor.
- 2.28 Oven, Sectional (Gas)
- 2.28.1 The oven shall be of the type to match the existing or as directed by the Contracting Officer. Provide number and type of sections as specified. Each section shall have ceramic hearths and separate thermostatic controls except if indicated otherwise. Provide hood fan interlock means.
- 2.28.2 Provide with stainless steel adjustable legs, or as otherwise noted, and a vent flue with diverter.
- 2.28.3 Fryer shall be provided with stainless steel fat container with stainless steel cover and automatic heat control.
- 2.28.4 Gang units flush together when more than one unit is specified. Provide rear gas connection of fryers to avoid front manifold pipe connection where indicated.
- 2.28.5 Fryers must be separated by at least 16" from any open flames on kitchen equipment .
- 2.29 Oven, Section, (Electrical)
- 2.29.1 The oven shall be of the type to match the existing or as directed by the Contracting Officer. Provide number and type of sections as specified. Each section shall have ceramic hearths and separate thermostatic controls except if indicated otherwise. Provide hood fan interlock.
- 2.29.2 Provide with stainless steel adjustable legs, or as otherwise noted, and a vent flue with diverter.
- 2.30 Bake Oven (Gas)
- 2.30.1 Oven shall be of the type and model to match the existing or as directed by the Contracting Officer consisting of insulated gas heated cavities, with blower fan, motor and controls. Each cavity shall be equipped with a full complement of wire racks. Provide with electric ignition to meet hood fan interlocking requirements.
- 2.30.2 Provide stainless steel adjustable legs, or as otherwise noted and vent flue with diverter.
- 2.31 Bake Oven (Electric)
- 2.31.1 Oven shall be of the type and model to match the existing or as directed by the Contracting Officer consisting of insulated electrically heated cavities, with blower fan, motor and controls. Each cavity shall be equipped with a full complement of wire racks. Controls shall be interlocked with hood exhaust fan to meet requirements.
- 2.31.2 Provide stainless steel adjustable legs, or as otherwise noted and vent flue with diverter.





### 2.32 Reconstituting Oven (Gas)

- 2.32.1 Oven shall be of the type and model to match the existing or as directed by the Contracting Officer with one large insulated gas heated cavity designed to rapidly reconstitute frozen foods to proper serving temperature. Unit shall be equipped with blower fan, motor, and single rack carriers in quantity one more than total number of ovens supplied.
- 2.32.2 Oven shall be mounted on sturdy welded steel stand, securely lagged to floor, that maintains an oven floor height equal to that of the oven cart Para 2.34. Provide one (1) rack removal hook per oven. Provide means to interlock with hood exhaust fan.

### 2.33 Reconstituting Oven (Electric)

- 2.33.1 Oven shall be of the type and to match existing or as directed by the Contracting Officer with one large insulated electrically heated cavity designed to rapidly reconstitute frozen foods to proper serving temperature. Unit shall be equipped with blower fan, motor, and single rack carriers in quantity one more than total number of ovens supplied.
- 2.33.2 Oven shall be mounted on sturdy welded steel stand, securely lagged to the floor, that maintains an oven floor height equal to that of the oven cart Par. 2.34. Provide one (1) rack removal hook per oven. Provide means to interlock with hood exhaust fan.

### 2.34 Oven Cart

- 2.34.1 Oven cart shall be designed for use with reconstituting ovens to receive single rack carrier from oven.
- 2.34.2 Provide with 5" (min.) dia ball bearing heavy duty swiveling type caster with polyurethane thinner. Two rear casters nearest handle bar shall be lockable. Cart shall lock latch with control near handle bar.

### 2.35 Microwave Oven

- 2.35.1 Oven shall be of the type and model to match existing or as directed by the Contracting Officer designed for 120/208 volt single phase, 60 cycle service. Provide proper plug to match electric receptacle. Line cord to be 6 ft. long of the three conductor line (grounding) type.
- 2.35.2 Unit shall be counter or table mounted, air cooled with push button or dial control. Door swing direction to match existing or as directed by the Contracting Officer.
- 2.35.3 Oven shall meet all applicable safety codes for microwave leakage. Operation shall only be possible with door securely closed.

### 2.36 Kettle (Gas)

- 2.36.1 The kettle shall be of the type, size, design and model to match existing or as directed by the Contracting Officer. It shall be a fully jacketed, insulated, gas fired, self generating steam cooker of min. #4 finish stainless steel with sanitary tangent (1-1/2" min.) draw-off faucet. Kettle shall be set on adjustable stainless steel legs.
- 2.36.2 Inner kettle shall be of 14 gauge, 18-8 type 304 stainless steel, and welded to stainless steel outer jacket. The unit shall have 3 tubular S.S. legs and adjustable feet which shall be fastened to floor with stainless bolts. The assembly shall have a dome shaped hinge cover of stainless steel made to fit the top rim of the unit. A heavy handle with plastic ball knob at the end shall be provided and so position on the cover to prevent vapor burn of operator's arm when opening. Cover shall open to approx. 10 degrees beyond vertical.



## 11000 - Equipment

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- 2.36.3 The unit shall be equipped with a thermostatic control, low-water safety cutoff, water gauge, emergency shutoff, pressure gauge, gas pressure control, gas solenoid valve, manual gas valve, safety pilot and electric ignition.
- 2.36.4 Unit shall have rear mounted junction box for 120 v. single phase electric ignition and controls ready for solid connection by electrical contractor.
- 2.36.5 Kettle shall have gas burner rated no less than 100,000 btu/hr. Provide rear mounted stainless steel flue with diverter.
- 2.37 Kettle (Electric)
- 2.37.1 The kettle shall be of the type, size, design and model to match the existing or as directed by the Contracting Officer. It shall be a fully jacketed, insulated, electrically fired, self generating steam cooker of min. #4 finish stainless steel with sanitary tangent (1-1/2" min.) draw-off faucet.
- 2.37.2 Inner kettle shall be of 14 gauge, 18-8 type 304 stainless steel, and welded to stainless steel outer jacket. The unit shall have 3 tubular S.S. legs and adjustable feet which shall be fastened to floor with stainless bolts. The assembly shall have a dome shaped hinge cover of stainless steel made to fit the top rim of the unit. A heavy handle with plastic ball knob at the end shall be provided and so position on the cover to prevent vapor burn of operator's arm when opening. Cover shall open to approx. 10 degrees beyond vertical. Kettle shall be equipped with side mounted swing spout funnel assembly. Unit shall be fully equipped all standard accessories including thermostatic control, low water safety cut-off, water gauge, emergency shutoff and pressure gauge.
- 2.37.3 Electric Requirements - The kettle shall be furnished with electric heating elements, thermostatically controlled for 208 volt, three-phase operation. The thermostat shall be of the limit control type and provided with low water cutoff; Robertshaw Thermostat Co., Model No. H-1 with Type "N" dial temperature adjustment with "OFF" position, pilot light, stuffing box and manual reset. The kettle shall be fully wired for satisfactory operation. Furnish a wiring diagram for approval of the Contracting Officer. Relay shall be mounted on side of kettle and shall be protected by means of stainless-steel housing and removable cover. If relay is not mounted on kettle, this Contractor shall furnish relay for mounting on wall in back of kettle. Provide kettle complete with rear mounted junction box ready for solid connection.
- 2.38 Steamer, Sectional (Gas)
- 2.38.1 General - Steamer shall be of the type and model No. to match the existing or as directed by the Contracting Officer, and of the design, construction and material herein specified.
- 2.38.2 Compartments
- 2.38.2.1 Steamer shall have two cooking compartments. Compartment shall be fabricated and welded to form a rigid one piece body, having back and both side walls constructed as one continuous piece of equipment. Body shall be made of 1/16" stainless steel interior and exterior. Each compartment shall have the capacity as indicated by Model number to match the existing or as directed by the Contracting Officer.
- 2.38.2.2 Each compartment shall be supplied with steam by a quick opening safety throttle valve conveniently located at the front. Steam valves shall be arranged so that doors cannot be opened until the steam is shut off. Each compartment shall have separate outlet with valves arranged to prevent intermingling of odors.



- 2.38.3 Door - Compartment doors shall be suspended on supporting arms which are hinged to compartment; hinges shall be equipped with pins and graphited bronze bushing (both removable). Doors shall be full floating type, not directly hinged but flexible supported. Doors shall be sealed by wheel operated ball bearing pressure screws located at the center on door arms, which shall drive doors against compartment faces exerting equalized pressure. Doors shall always seat properly without adjustment, regardless of wear on gaskets or hinges. Gaskets shall be special and securely fitted into recesses in doors without the use of cement. Doors shall be cast aluminum fitted and stainless metal liners. Doors may be secured by an approved hinge cam lever locking device.
- 2.38.4 Supports - Compartments shall be supplied with supports for steaming baskets consisting of non automatic pull-out shelves of stainless steel, reinforced with heavy welded bar frames or die formed 14 gauge stainless steel. Shelves shall be mounted on bronze rollers to match the existing or as directed by the Contracting Officer
- 2.38.5 Steaming Baskets - Provide stainless steel seamless perforated or solid steaming baskets to match existing or as directed by the Contracting Officer.
- 2.38.6 Heating
- 2.38.6.1 Steamers of the full automatic gas operated type shall be provided with gas, water supply and steam pressure automatically controlled as hereinafter described.
- 2.38.6.2 The steam shall be supplied from an ASME tubeless type boiler located in the base of steamer enclosed by stainless steel panels.
- 2.38.6.3 The boiler shall be heated by cast-iron gas burners connected to a concealed manifold.
- 2.38.6.4 Steamer shall be equipped with automatic controls. Outlet valves shall be connected to steam valves and operate simultaneously. Each compartment shall be fitted with thermostatic air vent. Provide specially designed regulator to control fuel consumption automatically, also line strainer automatic water regulator or feeder low water cut-off, timer, 100% safety pilot, electric controls and automatic boiler blowdown actuated by each use. Cutting off of electric power shall cut off gas supply to boiler but not affect pilot. Boiler safety valve handle shall be located in a frontal position in base cabinet clearly visible with identifying tag and readily actuated without danger.
- 2.38.7 Base - Steamer shall be mounted on adjustable feet of the same material as the steamer, and be secured to floor by means of stainless steel bolts and lead shields. Provide rear mounted junction box for solid connected of electric power for controls.
- 2.39 Combination Steamer and Kettle (Gas)
- 2.39.1 The combination steamer and kettle shall be similar to the type and model number to match the existing or as directed by the Contracting Officer complete with all accessories as herein specified.
- 2.39.2 Kettle - The kettle shall be self generating steam jacketed type constructed of 14-gauge stainless steel. The kettle shall be of welded seamless construction complying with this section except for boiler which shall be as specified below.
- 2.39.3 Steam Generator - One boiler shall supply steam to either or both units of the combination. The boiler shall comply with the requirements of the ASME code and shall be furnished with gas burner, 100% safety pilot, automatic gas control valve, pressure gauge, safety valve, water gauge, line strainer



## 11000 - Equipment

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automatic water feeder, low water cut-off, timer, and automatic boiler blowdown actuated by each use. Cutting off electric power shall cut off gas supply to boiler, but not affect pilot.

- 2 39.4 Provide adjustable stainless steel legs and attach unit securely to floors by means of stainless steel bolts and lead shields..

### 2.40 Combination Steamer and Kettle (Electric)

- 2.40.1 The combination unit shall be similar to the model number specified by the Contracting Officer, complete with all accessories as hereinafter to match the existing or as directed by the Contracting Officer.

- 2.40.2 Kettle - The kettle shall be two-third steam jacketed type constructed of 14 gauge stainless steel. The kettle shall be of welded seamless construction complying with except for boiler which shall be as specified below.

- 2.40.3 Steam Generator - One boiler shall supply steam to either or both units of the combination. The boiler shall comply with the requirements of the ASME code and shall be furnished with pressure gauge, safety valve, water gauge, line strainer, automatic water feeder, low water cut-off, timer and automatic boiler blowdown actuated by each use. Boiler safety valve handle shall be located in a frontal position in base cabinet, clearly visible with identifying tag and readily actuated without danger.

- 2.40.4 Base - Steamer shall be mounted adjustable feet of the same material as the steamer, and be secured to floor by means of stainless steel bolts and lead shields. Provide rear mounted junction box for solid connection of electric power by electric contractor.

### 2.41 Braising Pan, Tilting (Gas)

- 2.41.1 Braising Pan shall be of the type size, design and model to match the existing or as directed by the Contracting Officer. Unit shall be gas heated, of heavy duty all polished stainless steel construction with sanitary seamless tilting pan with center spout, tilt mechanism, cabinet stand, uniformly heated. .500" (min.) thickness, counterbalanced pan cover, fully enclosed burner assembly and tilt mechanism, timer and thermostatic control.

- 2.41.2 Gas burner shall be of the safety type electrically ignited, with automatic tilt shutoff. Cutting off electric power to ignition shall not affect pilot provide rear mounted junction box for solid connection of ignition electric power by electric contractor.

- 2.41.3 Provide pan rack steamer insert with three 12" x 20" x 4" perforated pans with covers and lift handler and food receiving pan support.

- 2.41.4 Base shall be of the open type (without cabinet) constructed of stainless steel. Lag base securely to floor with stainless steel bolts. Furnish swing spout filler faucet (T&S B-592 or equal) floor or wall mounted as indicated, for installation by other contractor as shown on drawing. Install with spout centralized over floor drain.

### 2.42 Braising Pan, Tilting (Electric)

- 2.42.1 Braising Pan shall be of the type size, design and model to match the existing or as directed by the Contracting Officer. Unit shall be electrically heated, of heavy duty all polished stainless steel construction with sanitary seamless tilting pan with center spout, tilt mechanism, cabinet stand, uniformly heated. .500" (min.) thickness cooking surface, counterbalanced pan cover, fully enclosed burner assembly and tilt mechanism, timer and thermostatic control.



## 11000 - Equipment

- 2.42.2 Electrical Heater shall be of fully shielded type, easily service with automatic tilt shutoff. Provide rear mounted junction box for solid connection.
- 2.42.3 Provide pan rack steamer insert with three 12" x 20" 4" D perforated pans with covers and lift handler and food receiving pan support.
- 2.42.4 Base shall be of the open type (without cabinet) constructed of stainless steel. Lag base securely to floor with stainless steel bolts. Furnish swing spout filler faucet (T&S B-592 or equal) floor or wall mounted as indicated, for installation by other contractor. Install with spout centralized over floor drain.
- 2.43 Convection Oven - Steamer Combination (Gas)
- 2.43.1 Unit shall be the type and model to match the existing or as directed by the Contracting Officer. Oven-steamer shall consist of a gas heated insulated cabinet with thermostatically and fan controlled steam generator and fan. Provide full front mounted controls including timer.
- 2.43.2 Unit shall be support on a sturdy steel frame with adjustable legs holding hearth 37" above floor except if otherwise noted on drawing.
- 2.44 Combination Twin Automatic Coffee Urn (Electric)
- 2.44.1 The urn shall be similar to the model to match the existing or as directed by the Contracting Officer, shall have the capacities specified, and shall be thermostatically controlled.
- 2.44.2 The unit shall be constructed of stainless steel with stainless steel housing enclosing the controls. This unit shall consist of two 2-1/2" gal. stainless steel liners with removable covers, enclosed in a jacket and heated by electricity. The draw off faucets shall be for single or double service as indicated by the Contracting Officer.
- 2.44.3 The unit shall have, thermostat (with low water cut off) thermometer, signal light, automatic water feeder, push button control and spray head for brewing the Coffee. Filter basket and filters shall be provided as specified.
- 2.44.4 The heating elements shall be of the size to match the existing or as directed by the Contracting Officer and shall be suitable for operation on a 208 volt, single phase circuit and all wiring shall terminate in a 4" junction box mounted on urn.
- 2.45 Single Automatic Coffee Urn (Electric)
- 2.45.1 The urn shall be similar to the model to match the existing or as directed by the Contracting Officer, shall have the capacities specified, and shall be thermostatically controlled.
- 2.45.2 The unit shall be constructed of stainless steel with stainless housing enclosing the controls. This unit shall consist of two 2-1/2" gal. stainless steel liners with removable covers, enclosed in a jacket and heated by electricity. The draw off faucets shall be for single or double service to match the existing or as directed by the Contracting Officer.
- 2.45.3 The unit shall have, thermostat (with low water cut off) thermometer, signal light, automatic water feeder, push button control and spray head for brewing the coffee. Filter basket and filters shall be provided as specified.



## 11000 - Equipment

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- 2.45.4 The heating elements shall be of the size to match the existing or as directed by the Contracting Officer and shall be suitable for operation on a 208 volt, single phase circuit and all wiring shall terminate in a 4" junction box mounted on urn.
- 2.46 Coffee Warmer (Electric)
- 2.46.1 The unit shall be similar to the model number to match existing or as directed by the Contracting Officer, and shall consist of an electric stove equipped with two heating elements and the coffee making equipment hereinafter described.
- 2.46.2 The body of the stove shall be of die formed stainless steel polished to satin finish.
- 2.46.3 Coffee making equipment shall consist of two (2) 12 cup semi-wide Pyrex glass decanters with pour-over upper. Furnish and deliver 100 extra and one (1) extra decanter with pour-over upper. Furnish and deliver 100 extra and one (1) extra decanter..
- 2.46.4 Electric Requirements
- 2.46.4.1 The coffee maker shall be wired to operate on a 12-volt, single phase circuit and shall be provided with six feet of approved three-wire cord (Grounding type) with plug to match receptacle.
- 2.46.4.2 Each of the heating elements shall be a heavy duty type, provided with an individual three heat switch with a maximum wattage of approx. 1700 watts.
- 2.47 Dish Dispenser, Portable
- 2.47.1 The dispenser shall be similar to the model number to match the existing or as directed by the Contracting Officer and of the design and construction indicated for built-in type, except the cabinet shall be of standard size and mounted on four all swivel rubber tired caster (two with brakes) and wrap around bumper. The outside top and sides shall be of stainless steel.
- 2.48 Food Warmer, Mobile
- The food warmer shall be of the manufacturer and model number specified by the Contracting Officer.
- 2.48.1 Body - The body shall be constructed of heavy stainless steel exterior on extra heavy angle iron frame to support body construction and drawer suspension frame. The heating chamber liner shall be made of rust proof steel. The entire cabinet shall be insulated by means of fiberglass or polyurethane foam.
- 2.48.2 Drawers - The drawers and their tops shall be made of heavy gauge stainless steel. Each drawer shall be mounted on individual suspension arm with roller bearings. Each drawer handle shall have an automatic self-locking latch to keep drawer closed air tight. Drawers shall be equipped with adjustable damper that will permit individual control of humidity. Drawer handles, latches and damper knobs shall be chrome plated. Number of drawers as required.
- 2.48.3 Electric Requirements
- 2.48.3.1 The temperature shall be controlled by means of a thermostat with signal light and relay switch, adjustable within a range of 100 degrees to 300 degrees F. If individual "Off" "On" switch is used it shall be equipped with a pilot light.
- 2.48.3.2 The heating element shall be of the capacity similar to Chromolox, or to match the existing as directed by the Contracting Officer and suitable for operation on 120 volt, single phase circuit. Heater shall be



equipped with 6'0" of 3 wire (grounding type), rubber covered cord, and plug similar to Hubbell No. 5264, or approved equal.

2.49 Food Warmer (Built-In)

The food warmer shall be of the manufacturer and model number. The specifications for the body, drawers and electric requirements shall be the same as those specified, except that the electric cord shall be omitted, and the unit equipped with a knock-out box for 3/4" Greenfield Connection. Trim strip and fillers of stainless steel shall be provided so that the cabinet may be built into the counter or as directed.

2.50 Hot Cabinet, Insulated, Moist Heat (Electric)

2.50.1 The cabinet shall be similar to the model number to match the existing or as directed by the existing or as directed by the Contracting Officer complete with thermostatically controlled heating unit, removable tray slides for 18" x 26" trays, heat distribution tunnel, and 5" dia. full swivel casters with non-marking polyurethane tires.

2.50.2 The entire body of the cabinet, including door, shall be fabricated of aluminum, and insulated with high density fiberglass.

The frame shall consist of special extruded shapes. Door and back shall be reinforced with heavy aluminum bar or channel. Pan support angles shall be of special alloy or aluminum, and space 3" on centers. Door hinges and door latches shall be of nickel steel. No lock required.

2.50.3 The heating unit shall be mounted at the bottom of the cabinet and shall consist of a formed tubular water-proof element and a lifetime lubricated fan assembly. The unit shall have "UL" approval, with thermostat, and pilot light, mounted on front panel. The Unit shall operate on a 120 volt, single phase circuit and shall be equipped with non-twist-lock receptacle, 3 wire connector, 8 ft. of 3-wire cord and plug. Wattage shall be 2000 watts (approximately).

2.51 Standard Equipment - General

2.51.1 The exact over-all dimensions of serving counters, dishwasher tables, hoods, etc., shall be obtained at the Building before Contractor starts fabrication.

2.51.2 This Contractor shall furnish and install all of the fabricated items or to match existing or as directed by the Contracting Officer as required. The equipment shall be as herein specified.

2.51.3 Equipment operated by electricity shall comply with the requirements of the Underwriters Laboratories Inc.

2.51.4 Samples of all hardware properly tagged shall be submitted to the Contracting Officer for approval before fabrication of the item.

2.51.5 the Contracting Officer shall select the color for the finish of all items not constructed of stainless steel or plated. Three samples of the finish on the same material used in the fabrication of the item shall be submitted for the Contracting Officer's approval. Size of sample 3" x 6" with hole in center of short edge. Back of sample shall have a sticker with the following data typed in::

BUILDING.....

TYPE OF FINISH.....





## 11000 - Equipment

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MF'D BY.....

- 2.51.6 Shop drawings will be required for all work included in this Section and shall show plan, elevation and sectional views, including materials and dimensions. Drawings shall be submitted in quintuplicate for the Contracting Officer's approval. If it should be necessary to deviate from the drawings due to job conditions, such modifications must be included and noted on the shop drawings. This Contractor shall check door openings, etc., at the building before fabrication of the equipment so that some can be moved into the building and installed without difficulty. Items such as hoods, counters, etc., shall be fabricated in sections if necessary.
- 2.51.7 Equipment constructed of stainless steel shall have a satin finish except as noted otherwise on detail drawings. Material other than stainless steel shall be finished as specified for the item.
- 2.51.8 Where equipment is attached to walls provide expansion bolts and shields in solid material, and toggle bolts in hollow material.
- 2.52 Exhaust Hood - Filter Type
- 2.52.1 General
- The dimension of the hood and flues shall be checked at the building before fabrication. The hood shall be recessed into the dropped ceiling or be provided with removable aluminum enclosure panels at the sides and front in cases where the hood is below the dropped ceiling.
- 2.52.2 Construction
- All joints shall be made airtight. If rivets are used they shall be spaced as specified or required. The joints may be welded with the welding done on the outside top and sides of the sheets.
- 2.52.3 Grease Filter
- Filters shall be of the removable type, 20" x 20" x 2" thick in size, installed in leak tight holding frames permanently attached to hood at an angle not less than 45 degrees. Filter holding frames shall be equipped with a easily actuated latching device providing for readily removal of filter. Filter shall be of the baffle type, constructed of stainless steel. Provide two (2) full sets of approval filters for each hood installation.
- 2.52.4 Light Reflector Panel
- Light reflector panel shall be provided at the lower outside edge of the hood. Seal opening with gaskets after lights are installed. Provide angle clips for supporting the electrical boxes in the location required.
- 2.52.5 Angles, Clips and Supports
- The hoods shall be support by means of clips projecting from front frame angles as shown on detail and bolted to curtain wall angle support.
- 2.52.6 Flues
- The hood shall be provided with flue flanges and shall be connected by means of a flue connecting piece to the flue outlets.
- 2.52.7 Finish





All portions of the hood constructed of stainless steel shall be polished to satin finish. All angles and flats not of stainless steel shall be painted two coats of red rust resistant enamel.

Note: This contractor shall check opening in dropped ceiling for range and dishwasher hoods and shall determine the exact location for the hoods flue before fabrication and make necessary adjustments so that hoods will be properly secured.

### 2.53 Exhaust Hood - Non -Filter Type

#### 2.53.1 General

The dimension of the hood and flues shall be checked at the building before fabrication. The hood shall be recessed into the dropped ceiling or provided with a removable aluminum enclosure panels at the sides and front in cases where the hood is below the dropped ceiling.

#### 2.53.2 Construction

All joints shall be made airtight. If rivets are used they shall be spaced as specified or required. The joints may be welded with the welding done on the outside top and sides of the sheets.

#### 2.53.3 Light Reflector Panel

Light reflector panel shall be provided at the lower outside edge of the hood in the location shown in the scope of work. Seal opening with gaskets after lights are installed. Provided angle clips for supporting the electrical boxes.

#### 2.53.4 Angles, Clips and Support

The hoods shall be supported by means of clips projecting from front frame angles and bolted to curtain wall angle support.

#### 2.53.5 Flues

The hood shall be provided with flue flanges and shall be connected by means of a flue connecting piece to the flue outlets.

#### 2.53.6 Finish

All portions of the hood constructed of stainless steel shall be polished to a satin finish. All angles and flats not of stainless steel shall be painted two coats of red rust resistant enamel.

### 2.54 Exhaust Hood, Self Washing Type

2.54.1 Exhaust hood shall be designed to extract grease by passing exhaust air over a series of fixed baffles that entrap grease. These baffles are cleaned of grease by a sprayed mixture of hot water and detergent controlled by an automatic cycle control which can also be manually actuated.

2.54.2 Unit shall be constructed of all 18 gauge (min) type 304 stainless steel (line polish finish) with all welds ground and polished. Front access panels to check functioning of spray nozzles shall be provided. Ventilator clearance to floor shall be 7'2" (min.)

2.54.3 Control panel shall consist of solid state controller, manual gate valve, line strainer, solenoid, check valve, detergent pump and, reservoir pressure gauge, vacuum breaker and all other required parts. Panel shall be 18 ga. stainless steel. Control buttons shall be 5'0" above floor.



## 11000 - Equipment

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2.54.4 Provide lights within hood to be connected by electrical contractor. Hot water and indirect drain connections by Plumbing contractor. Installation of fire control system be coordinated with hood installation. Ventilator shall have NFPA, NSF and all other required approvals. Kitchen Contractor to make all required connections between Hood and control panel.. Provide Shop Drawings.

### 2.55 Dishwasher Hood

#### 2.55.1 Dimensions

Dimensions for the hood shall be checked at the building before fabrication. The hood shall be recessed into the dropped ceiling or provided with removable aluminum enclosure panels at the sides and front in cases where the hood is below dropped ceiling.

#### 2.55.2 Construction

The interior of the hood shall be rounded at the front and sides. All joints shall be airtight and of lock-seam type. Hood shall have mitered corners (welded, ground smooth and made airtight); a full back secured at bottom to the wall with expansion bolts (for brick) or toggle bolts (for terra-cotta), the bottom edge turned in on all four sides to form a condensation drip gutter (and provided with a drain connection welded to the underside). The front edge shall be secured to curtain wall support angles.

#### 2.55.3 Connection

The flue shall be provided with a flue flange or flanges as shown on the Standard Details and when necessary shall be connected by means of a flue connecting piece to existing duct by the kitchen contractor.

#### 2.55.4 Finish

All portions of the hood constructed of stainless steel shall be polished to satin finish. All angles and flats not of stainless steel shall be painted two coats of red rust resistant enamel.

### 2.56 Sinks

2.56.1 The same gauge metal shall be used throughout for all portions of the sink. All joints shall be a continuous weld, ground smooth and polished so that all portions of the sink will form a continuous unit to simulate one piece construction. The top and ends of the splash back shall be flanged back to form a 90 degrees angle. The top edge of the sink and drain boards shall have an integral continuous channel or rolled shaped edge. Drain boards shall be pitched to sink and sink bottom shall be scored and pitched to waste outlet. The top of splash back shall be secured to a continuous angle (approximate the same length as splash) fastened to the wall. When the end of sink or drain boards are adjacent to a wall or a pilaster, that portion shall be turned up to form a backsplash and welded to form a continuous integral back. The top of end backsplash shall be secured to continuous angle same as backsplash.

2.56.2 Double compartment sinks shall have a double partition. Where the horizontal and vertical edges of partition meet the sink, they shall be coved to a radius. The space between partition at bottom, front and back shall be enclosed to simulate one-piece construction.

#### 2.56.3 Waste Connection

Each sink compartment shall be fitted with a quick opening lever handle waste with screw top outlet with overflow. The strainer plate shall be set to insure proper drainage of the sink bottom. Bottom



shall be depressed at an angle of 30 degrees and 3/4" deep to receive waste outlet. The waste outlet shall be connected to the sink bottom.

### 2.56.4 Support

Sinks shall be supported at front by 2" diameter, 16 ga. stainless steel legs and supported at the rear by means of angles and brackets fastened to wall. Legs shall be secured at the top by stainless steel sockets welded to the sink. The bottom of the legs shall be provided with adjustable feet.

### 2.57 Tables, Heavy Duty - Work and Preparation - General

2.57.1 The tables shall be of the construction herein specified. Table shall be constructed with metal, wood or plastic tops, as specified and provided with drawer where required. Supported on stainless steel tubing frame and provided with metal under shelving. Metal or wood tops are provided with drawer where required. Metal upper shelving shall be provided where required.

### 2.57.2 Metal Top

2.57.2.1 Metal table top shall be constructed of a single sheet of stainless steel where possible with outside edges rolled to a radius to match existing or as directed by the Contracting Officer. The corners of top shall be rounded to form a bullnose and made integral with the top and rolled edges, ground smooth and polished. Welded filler pieces may be used for forming these corners. The tops shall be reinforced along the longitudinal center line with channels of the same gauge and material as the top and welded to the underside of the top.

2.57.2.2 Transverse angles or channels of same gauge and materials as top shall be provided for attaching tubing leg sockets. These angles or channels shall be spot welded to table top.

### 2.57.3 Metal Baffles

Metal top where indicated on drawings shall be flanged up 2" as indicated on detail. The ends of baffle shall be flanged back to form a 90 degrees angle and welded. All corner joints shall be provided when tables adjoin wall and when tables are installed back to back.

### 2.57.4 Wood or Plastic Tops

Wood top shall be select edge grain kiln dried to a moisture content of not more than 4% by weight. The top shall be fabricated of 2-1/4" strips glued with waterproof casein glue. Top shall be reinforced with rods of the diameter and spacing required; the top bored (not channeled) for tie rods. Tie rod holes concealed with hard wood plugs.

### 2.57.5 Metal Drawer.

2.57.5.1 The body of the drawer shall be die drawn or formed out of one piece Stainless Steel Sheet by turning up the two sides and the back and double seaming and soldering the vertical seams at the back. The top edges at the sides shall be hemmed back on the outside and on the back. The body of the drawer where it is fastened to the front shall be flanged out on the sides and bottom and spot welded and floor soldered to the drawer front. The drawer front shall have all corner edges rounded. The top edge of the drawer front may be hemmed or flanged back 1/2" to the inside of the drawer to stiffen the top edge. All joints shall be made sanitary and vermin proof. All joints shall be made removable and non-tilting when completely open. The drawer shall be provided with a set of channel slides set in suspension channel guides. Each guide shall be fitted with ball bearing sheaves, a combination



## 11000 - Equipment

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drawer bumper and automatic stop. The stop shall be positive acting and accessible for releasing the drawer.

2.57.5.2 The drawer shall be provided with approved type drawer pull and C.P. brass pin tumbler cabinet type lock. All locks shall have the same combination and provide a total of 6 C.P. brass keys with metal tags, stamped "B. of E." and also with the following letters "KT" for Kitchen Tables. Provide three keys and tags marked CT-1, 2, etc., "CT" for each Cashiers Table, which shall all be different. The combination for each Cashiers' Table shall be different.

2.57.6 Guides and channels shall be rigidly secured. Drawer shall operate smoothly and easily without sagging, side play, sticking, or binding. Drawer guides shall be designed to permit adjustment for proper alignment at top, bottom and sides of drawer. The space between guides at rear shall be sealed with stainless steel sheet extending from rear of drawer to underside of table top to prevent vandalism.

### 2.57.7 Metal Undershelving

The table shall be provided with a removable lower shelf extending from table leg to table leg. The shelves shall be flanged down. All shelves shall be reinforced along the longitudinal center line with a channel of the same gauge and material as the shelf, welded to the underside.

### 2.57.8 Metal Upper Shelf or Shelving

The sides and back edge shall be flanged up and front edge flanged down to from 90 degrees angle; corners shall be rounded, welded, ground smooth and polished. Shelf shall be welded to metal angle uprights and the uprights securely attached to the wood or metal tops.

### 2.57.9 Metal Upper Shelving (two tiers high)

Metal upper shelving shall have all outside edges flanged down at right angles, with corners rounded, welded and ground smooth. Shelves shall be supported on standards and fittings secured to the table tops.

### 2.57.10 Tubing Frame Work

Legs shall be welded in metal sockets at the top. The gussets shall be welded to the transverse channels of the table top and secured to the legs with stainless steel "Tee" bolts (head bent to suit radius of gusset), nuts and washers. The legs shall be provided with adjustable feet.

### 2.58 Preparation Table, Heavy Duty, with Tray Slides

General construction with one section, between shelf and table top, of 14 ga. stainless steel pan slides spaced on two (2) inch centers, eleven (11) tiers high and designed to hold 18" x 26" pans.

The slides are to be welded to four (4) vertical 2" x 2" stainless steel angles. Angles to be bolted to bottom shelf and top fastened with blind bolts to underside of table.

### 2.59 Preparation Table, Portable

2.59.1 General construction shall be entirely of stainless steel, except where noted. Top shall be one piece die stamped construction of 14 gauge stainless steel with channel reinforcement around perimeter.



- 2.59.2 Legs shall be round stainless steel tubing of 16 gauge of seamless construction of diameter, not less than 2". Provide cross braces, or bottom rail, of 16 gauge wall stainless steel round tubing between the legs at the ends and front. No rail shall be required between the two rear legs.

NOTE: All welds shall be ground smooth and polished.

- 2.59.3 Table shall be portable of size required. Swivel wheels, similar to Colson No. 2-5067-65-9, with replaceable Polyurethane tires. The two rear wheels shall equipped with brakes.

### 2.60 Cook's Table and Pan Rack (Type CTPR)

The cook's table shall be constructed with a metal top, metal drawer and supported on tubing frame; provide with metal undershelfing and pan rack. The top drawer pipe frame and undershelfing shall be of the construction and finish specified "Tables - Heavy Duty." The pan rack shall be constructed of stainless steel tubing supporting the rack shall be secured to the underbody of the table. The stainless steel shapes forming the rack shall be welded to the vertical pipe standard and be provided with small stainless steel hooks.

### 2.61 Baker's Table (Type BTWS)

#### 2.61.1 General

The baker's table shall be constructed with wood or approved plastic top and metal angle baffle screwed to wood top, a metal cabinet enclosed upper, shelf, metal drawers, three (3) portable plastic ingredient bins with covers and a portable shortening container.

#### 2.61.2 Wood and Plastic Tops

Table tops and frame work shall be constructed as specified in this section, with additional railing.

#### 2.61.3 Metal Drawers

The metal drawers shall be constructed and finished as specified in this section under "Metal Drawer", except as herein noted. The edges of the drawer front shall be flanged back 1/2" and corners rounded, welded, ground smooth and polished.

#### 2.61.4 Ingredient Bins

The bins shall be removable, mounted on casters and provided with handles. The body of the bins shall be one of piece plastic construction with all corners coved to a radius. Provide a sliding cover for bin top, with handle.

#### 2.61.5 Metal Upper Shelf

The metal cabinet enclosed upper shelf shall be constructed as required

#### 2.61.6 Support

The table shall be supported on stainless steel tubing legs and railing.

### 2.62 Cashier's Table

- 2.62.1 The table shall consist of a metal top with drawer, mounted on stainless steel tubing frame with adjustable legs and secured to floor with stainless steel bolts.

#### 2.62.2 Metal Top



## 11000 - Equipment

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The top shall be of the construction, material and finish as specified in this section except it shall be turned down at 90 degrees angle instead of having rolled edge. Drawer shall be similar to that specified (Metal Drawer) and be of the size provided with a lock, keys with metal tags, and removable cash drawer with lock combination and partition.

### 2.62.3 Support

Frame shall be constructed of 16 ga. stainless steel tubing legs (frame-work for table), with adjustable flanged feet for attaching to floor.

### 2.63 French Fry Bagging Unit

2.63.1 Unit shall be of all stainless steel construction, with french fry holding tray, bag holders, rear mirror, heat lights as specified.

2.63.2 All electric wiring shall be in accordance with the applicable electrical codes. Provide (8) ft heavy duty cord with one grounding conductor and heavy duty plug for connection to 120 V, 1 ph, 60HZ, 15 amps receptacle.

2.63.3 Unit shall be supported on four (4) heavy duty 5" dia. caster with polyurethane tires and locks.

### 2.64 Hot Food Holding Table

2.64.1 Unit shall consist of a table of construction similar to that specified with two electrically heated food display levels.

2.64.2 Holding table shall be of all stainless steel construction as required, equipped with four (4) heavy duty 5" polyurethane casters with locks.

2.64.3 All electrical wiring shall be in accordance with applicable electrical codes. Bring out two (2) eight (8) ft heavy duty three conductor (one grounding) line cords with heavy duty plugs for connecting two (2) 120 V, 1 ph., 60HZ, 15 amps receptacle.

### 2.65 Utility Table, Portable, Type "UTP"

2.65.1 Table shall be of all stainless steel construction with top and frame.

2.65.2 Unit shall be provided with four (4) - 3" heavy duty caster having polyurethane tires and locks.

### 2.66 Condiment Stand (Mobile)

2.66.1 Condiment stand shall be of all stainless steel construction with sliding door under cabinet and top cut to take condiment. pumps and trays for condiments

2.66.2 Unit shall be provided with four (4) - 3" heavy duty casters having polyurethane tires and locks.

### 2.67 Slicer/Mixer Table

2.67.1 Slicer/Mixer Table shall be of all stainless steel fabrication.

2.67.2 Table shall follow the designs of Table Type "UTP" except be 24" x 30" x 32" high in size intended for use with slicers and mixers.

2.67.3 Provide table with four (4) - 3" dia heavy duty casters with polyurethane tires and locks. Lag slicer or mixer to table with approved stainless steel fasteners.



### 2.68 Service Shelves

2.68.1 Service shelves shall be of 14 gauge stainless steel construction of size, location and number of tiers as required.

2.68.2 Shelves shall be fabricated with as few sheets as possible (84" length or longer preferred). Transverse joints shall be butt welded, ground smooth and polished. The front and side edges shall be turned down with corners rounded and welded, attached to the brackets by spot welding or with concealed fastenings and secured with nuts and washers. Shelves shall be flanged up to form a splash back, crimped and secured to the wall. The underside of all shelves and back of the splash back shall be finished with an approved composition of sound deadening material.

### 2.69 Serving Counter (Fixed)

#### 2.69.1 General

Counter shall be supported by six inch adjustable legs and consist of hot wells, cold wells, salad unit, sandwich unit, open counter section, milk well, ice cream section plate/silver dispenser, cashier section, and other required units. All opening in counter for piping wiring, etc. shall be made by the kitchen contractor with all final connection made by other contractor. Kitchen contractor shall extend all drain lines to indirect connection to floor drains.

#### 2.69.2 Frame Work

The counter body, including all the units as herein described, shall be built over a framework of angles. All corners shall be mitered and welded. All shop joints shall be welded and field joints bolted, unless otherwise noted. The frame shall be strong and rigid with exposed joints ground smooth.

#### 2.69.3 Intermediate Bracing

Intermediate angle bracing shall be provided in the General Counter Section at the vertical front, back and transversely across the top and bottom of the frame, spaced approximately 5'0" on centers, unless otherwise required.

#### 2.69.4 General Counter Body

This unit shall be provided with a bottom shelf, upper shelf and a partition, where unit adjoins a hot well or cold pan unit. Provide sliding doors the full height and length of counter, unless otherwise required.

#### 2.69.5 Bottom Shelf

The bottom shelf shall be constructed with side and front edges flanged down at a 90 degrees angle. The back edge shall be flanged down and hemmed back over the framework. Weld all edges to frame work. The longitudinal center line of shelf shall be reinforced with a channel shaped stiffener of the same material and gauge, welded to the underside.

#### 2.69.6 Upper Shelves

The upper shelf shall be made in removable sections, each section not to exceed 30" in length unless otherwise indicated. All outside edges shall be flanged down to a 90 degrees angle and turned in and edges hemmed to form a channel shaped edge, corners welded and ground smooth. Longitudinal center line shall be reinforced with a channel shaped stiffener of the same material and gauge, welded





## 11000 - Equipment

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to the underside. Shelving shall rest on an angle frame with corners mitered and welded. Weld angle frame to body framework.

### 2.69.7 Door and Guides

Doors shall be not less than 5/8" thick, constructed of an outer panel and inner liner flanged on all four sides, corners welded and ground smooth. (The inner lining telescoping the outer panel and welded.) The outer panel shall be stiffened at the vertical center line with a channel shaped section. Doors shall be provided with reinforcement plate welded to back of outer panel for door bottoms and shall be heavy duty ball-bearing type. Each door shall run on the bottom and guide in a channel at top. Guides at top to run full length of the counter. Doors shall not exceed 36" in length. Doors shall be removable without the use of tools and provided stops to keep doors from bumping into door handles. Doors covering compressor compartment of cold pan body shall not be louvered. Louvers shall be provided in fixed panel above doors. Door handles shall be of the offset type and secured with Phillips stainless steel oval head machine screws tapped into the door handle reinforcing plate. Overhead type suspension sheaves may be submitted for approval.

### 2.69.8 Hot Wells and Cold Pan Body

These units shall be provided with a bottom shelf. Provide sliding doors the full length of unit (where required). The ends of each unit shall be provided with metal partitions. Provide a metal panel over the doors of the steam table unit. Bottom shelf, doors and guides shall be constructed as specified under "General Counter Body." Provide a towel ring secured to the panel at the location required. The compressor shall be mounted in the pipe space under the counter and be supported on angles or channels secured to counter frame angles or as otherwise required. The space for the compressor shall be separated from the cold pan body by means of a partition.

### 2.69.9 Electric and Other Requirements for Hot Wells

2.69.9.1 The type and number of hot food receptacles shall be as required. Each receptacle shall contain one or two calrod heating elements controlled by an infinite heat control mounted on the rear panel at back of hot wells. The thermostat shall have an integral or separate pilot light mounted required.

2.69.9.2 A trough with removable panel shall be provided in rear upper section of steam table for installing wiring and thermostats shall be recessed into the removable panel so that individual thermostats may be removed without affecting the others. A ventilated switch box with removable cover shall be provided in the upper rear section of the pipe space for installing switches, signal light, bus bars, etc. Openings shall be provided where required for wiring connections from bus bars to thermostats, dish dispensers, service connection to switch box; also cold pan compressor connections. The switch box and cover shall be required. Signs shall be provided to identify disconnect switches and receptacles.

2.69.9.3 This Contractor shall furnish and install all switches, bus bars, receptacles, signal lights, etc., in switch box, together with all wiring to and including three pole disconnect switches. All wiring shall be tinned copper with water and heat resisting insulation. The elements for each hot food receptacle shall be wired for 208V single phase operation and installed in accordance with manufacturer's recommendations.

2.69.9.4 The Electric Contractor will furnish and install a 208 volt circuit to switch box in pipe space, and extend and connect to disconnect switch for steam table.

### 2.69.10 Electric Requirements for Cold Pan





2.69.10.1 Furnish and install cold pan switch box in pipe space operating switch with pilot light as required. Compressor Unit including pressure switch shall be completely wired, ready for final outlet box on motor by others.

2.69.10.2 Other Contractor will furnish and install a 120 V, single phase circuit from source of supply to switch box, in pipe space and extend circuit from switch box on compressor and connect to motor.

### 2.69.11 Dish Dispensers (Built-In Type) Electrically Heated

The automatic dispenser shall be of the model number to match existing or as directed by the Contracting Officer and of the design and construction herein specified. The heater cabinet shall consist of an angle frame with exterior and interior panels of not less than 20 gauge stainless steel. The space between panels shall be filled with sheet rock or glass wool insulation. The cabinet shall be supported on 1-1/2" x 1/8" transverse frame angles welded to counter frame angles so that bottom of cabinet is approximately 5-3/4" above floor. The upper part of heater cabinet shall be of special size to built into counter. The top of the counter shall be cut out to receive the dispensers. The dispensers shall be calibrated to the size and weight of the dishes to be used.

### 2.69.12 Electric Requirements for Dish Dispenser

Each heater cabinet shall be equipped with three approx. 265 watt, 220 volt, single phase strip heaters thermostatically controlled and fully wired. All wires shall terminate in a junction box mounted on side of cabinet and extend into wiring space of steam tables. Wiring shall be connected to steam table circuit.

### 2.69.13 Open Counter Section

Open counter section shall be of size required, and shall be formed by omitted sliding doors, bottom, and upper shelves. Partitions shall be provided at each end of open counter section.

### 2.69.14 Pipe Space

A pipe space shall be provided between the steam table and cold pan units, where required. Provide a door fitted with semiconcealed type hinges, door handle and catch. The pipe space shall be left open at bottom. The door shall be constructed as specified.

### 2.69.15 Panels and Trim

The front and exposed ends of the serving counters shall be finished with panels. These panels shall be made of a single sheet from top to bottom and bottom edges shall be straight and true. The panels shall be of equal lengths and cover the entire length of the counter front. The vertical joints of panels shall be trimmed with flats and secured to panels or frame invisible fasteners. The vertical strips shall be spaced as required.

### 2.69.16 Counter Tops

Tops shall be fabricated of maximum possible size 14 ga. stainless steel sheets (96" length or longer preferred). No longitudinal joints will be permitted. The front and back edges and the ends shall be flanged down to 90 degree angles with corners mitered, welded, ground smooth and polished. Shop transverse joints shall be butt welded, ground smooth and polished. Field transverse joints, where necessary, shall be reinforced with a strap of the same gauge and material as the top. This strap shall be welded to one section of the top and the field fastening shall be made by means of invisible flush head countersunk bolts, bolted to a perfect alignment, welded, ground smooth and polished. No



## 11000 - Equipment

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solder will be permitted in transverse field joints. Tops shall be secured to framework with concealed stainless steel fastening. Where the counter top abuts a wall or column, the top shall be flanged up to a 90 degrees angle and an angle scribe cap of the same material shall be fitted over this edge, flush against the wall or column, welded, ground smooth and polished.

### 2.69.17 Hot Wells Section Top

Hot wells top shall be of the length, design and number of wells as required. Top shall be one piece of 14 gauge stainless steel sheet cut out to take 12" x 26" x 6" deep pans with 1/2" (min.) radius corners, and a 1" deep fold-down all around each well, including corner. All corners shall be rounded and polished and, if welded, ground smooth and polished. Heated well units shall be of seamless construction with rounded corners. Wells shall be of the insulated type. Provide two (2) sets of stainless steel pans, with covers for each hot well section.

### 2.69.18 Cold Pan Top and Cold Pan

2.69.18.1 The top shall be cut out and flanged down to suit the cold pan insert.

2.69.18.2 The cold pan shall be of the length, width and inside dimensions required. The pan shall be formed out of one sheet by turning up the sides, front and back and welding all vertical seams watertight. The pan be secured to the counter top, provided with breaker strips and supported in approved manner. The bottom of the pans shall be pitched to a waste outlet located at the end of the pan adjacent to the pipe space; and shall be provided with removable false bottom. The waste outlet shall silver soldered to bottom of the pan.

2.69.18.3 Cold plates shall be welded or tubing soldered to sides and underside of cold pan insulated with glass wool as required. The casing enclosing the insulation shall be supported from cold pan top as required.

### 2.69.19 Combination Cold Pan and Sandwich Unit.

2.69.19.1 The combination unit shall consist of a refrigerated cold pan removable false bottom and sliding cover together with sandwich pans and covers.

2.69.19.2 The rear portion shall be provided with a carving board, plate storage shelf, scrap chute and scrap box.

2.69.19.3 The general construction of the cold pan body shall include sliding doors.

### 2.69.20 Milk Well

2.69.20.1 Milk well shall be with cavity thermostatically controlled at 35 degrees F., of dimensions required.

2.69.20.2 Equip cavity with removable lowerator mechanism of all stainless steel construction.

2.69.20.3 Cover shall be of the sliding type, insulated stainless steel, equipped with locks.

### 2.69.21 Ice Cream Well

2.69.21.1 Ice cream well shall be with cavity thermostatically controlled at +20 degrees F of dimensions required.

2.69.21.2 Equip cavity with removable lowerator mechanism of all stainless steel construction.

2.69.21.3 Cover shall be of the sliding type, insulated stainless steel, equipped with locks.



### 2.69.22 Tray Stand/Silver Dispenser

2.69.22.1 Provide tray stand/silver dispenser section shall be of stainless steel construction and size as required.

2.69.22.2 Silver dispenser shall be of the elevated type with eight (8) removable plastic cylinders of construction equivalent to Shelly Model TS or approved equal.

2.69.22.3 Provide sliding door under-cabinet.

### 2.69.23 Counter Legs

The counter shall be mounted on approved stainless steel legs, No. 4 Finish. The adjustment bolt may be made of carbon steel which shall be enclosed in stainless steel. Legs shall be provided with ledge, adjustable at the top portion for leveling and resting solidly on the floor. The legs shall be designed to provide a space of 6" from finished floor to the bottom edge of the counter when the adjustment on the leg is screwed all the way into the end of the thread. The legs shall be bolted to counter body.

### 2.69.24 Protector Case and Display Case

#### 2.69.24.1 General

A protector case consisting of a single shield and one shelf shall be provided over steam table section as required. A display case consisting of three shields and triple shelf shall be provided over the cold pan section and balance of General Counter as required.

2.69.24.2 The vertical and obtuse angle uprights shall be made of stainless steel square tubing. At the base provide a square flange with rounded corners. The base shall be tapped for a round head machine screw, screwed into the base from the underside of the counter top. At the top provide a formed cap and weld base to the upright.

2.69.24.3 The upright, front and rear, shall be equally spaced along the length of the counter top not more than 3'6" on centers except where the rear upright interferes with the cold pan or steam table section; that upright shall be omitted, and an additional horizontal rail shall be provided to reinforce the horizontal rail above it. This span shall be braced from the front upright. The horizontal rails shall extend and be welded to each upright. The horizontal rails shall extend and be welded to each upright both longitudinally and transversely.

2.69.24.4 All glass shall be of the finest quality of 1/4" tempered glass with all edges ground true to insure a snug fit. The glass shelves shall be supported on the horizontal rails by means of supporting clips. The clips shall be secured with machine screws tapped into the rails or by welding. The top, ends and lower edges of all glass shields shall be set in channels. Edges shall be puttied in the channels. All joints in the glass section shall occur at the vertical uprights. The glass sections shall be removable for replacement purposes.

### 2.69.25 Finish

All portions of the counter not constructed of stainless steel including angles or channels shall be finished with two coats of rust resistant primer. All tubing shall be polished to a satin finish.

### 2.69.26 Samples



## 11000 - Equipment

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Submit samples of material and finish before fabrication. Samples of tray slide brackets and tubing, counter legs, glass and tubing for protector cases and display cases shall be submitted for the Contracting Officer's approval before fabrication.

### 2.70 Serving Counters, Mobile, Modular Type

#### 2.70.1 General

Counter shall consist of separate mobile, modular units provided with side latches so all unit may be latched together to form a continuous line up. All units shall be of stainless steel construction with 16 gauge top, support by four (4) - 5" heavy duty casters with polyurethane tires, the two at the service side equipped with locks. Serving units shall be designed for single or double side service, as noted on drawings, and electrically heated or cooled, as required, from a 120 V, 1 phase 60HZ, 15 amp power source. Connection to electric receptacle shall be by a light (8) ft heavy duty three conductor (one grounding) line cord with heavy duty plug to match receptacle.

#### 2.70.2 Design

Mobile units shall be of the type and size required. Units shall be provided without work shelf or tray slide unless other wise required. All transparent panels shall be 1/4" tempered glass framed in a 20 gauge stainless steel channel member. All refrigerated units shall be provided with a compressor of the manufacturer's recommended horsepower.

### 2.71 Hot Wells Server

2.71.1 Server shall be of the construction, size and number of wells as required. Unit shall be of the type, manufacture and model number.

2.71.2 Provide with stainless steel full length overshef having glass sneeze guard at front and sides unless otherwise required. Supply 12" x 20" x 6" stainless steel pans with covers in an amount double the number of hot wells.

2.71.3 For five (5) or more wells bring out power on two (2) electrical line cords with plugs suitable for 120 volt, 1 phase, 60 HZ, 15 amp use.

### 2.72 Cold Pan Server

2.72.1 Server shall be of construction and size as required. Unit shall have refrigerated cold pan and be of the type, manufacture and model number.

### 2.73 Salad Server

2.73.1 Solid Server shall be of construction and size as required. Unit shall refrigerated cold pan and be of the type, manufacture and model.

2.73.2 Provide full length canopy of the double sloped (non-curved) non-illuminated type, with 1/4" thick one piece Plexiglas transparent panels having stainless steel U member framed edges and 1/2" (min.) radius corners. Supply with two (2) sets of salad bowls and salad pans with covers.

2.73.3 Refrigerator compressor shall be of the manufacturers standard horsepower, 120 volts 60HZ, 1 phase. Provides six (6) ft. heavy duty three conductor (one grounding) line cord with plug to match receptacle.

### 2.74 Cashier's Section



## 11000 - Equipment

- 2.74.1 Cashier's section shall be of the construction and size as required. Unit shall be of type, manufacture, and model number to match the existing or as directed by the Contracting Officer.
- 2.74.2 Unit shall be provided with cash drawer, front panel and front rest bar.
- 2.75 Flat Top Section
- 2.75.1 Flat top section shall be if the construction and size as required. Unit shall be model number to match the existing or as directed by the Contracting Officer.
- 2.75.2 Supply unit with frontal plastic decorative panel, color as selected.
- 2.76 Milk Section
- 2.76.1 Milk section shall be refrigerated, lowerated well type unit . Unit shall be of type, manufacture and model number to match the existing or as directed by the Contracting Officer.
- 2.76.2 Provide with full length glass display shelves if required. Refrigeration compressor unit shall meet all requirements of Par. 2.2.3.2. Unit shall be provided with thermometer and locking cover as required.
- 2.77 Ice Cream Section
- 2.77.1 Ice cream section shall be refrigerated, lowerated well type unit of construction as specified. Unit shall be of type, manufacture and model number to match the existing or as directed by the Contracting Officer.
- 2.77.2 Provide with full length glass display shelves if required. Refrigeration compressor unit shall meet all requirements of Par. 2.2.3.2.. Unit shall be provided with thermometer and locking cover.
- 2.78 Combination Milk/Ice Cream Section
- 2.78.1 Combination milk/ice cream section shall be refrigerated, lowerated well type unit of construction as specified. Unit shall be of type, manufacture and model number to match the existing or as directed by the Contracting Officer.
- 2.78.2 Provide with full length glass display shelves if required. Refrigeration compressors maintaining proper temperature in each well shall meet all requirements of Par. 2.2.3.2. Unit shall be provided with thermometer and locking covers.
- 2.79 Tray/Silver Dispenser Section
- 2.79.1 Tray/silver dispenser shall be of construction and size as required. Unit shall be of type, manufacture, and model number to match the existing or as directed by the Contracting Officer.
- 2.79.2 Provide two (2) sets of plastic silverware containers.
- 2.80 Mixer, Floor Type
- 2.80.1 The mixer shall be to match the existing or as directed by the Contracting Officer complete with the accessories. This item shall be attached to floor by means of stainless steel bolts and expansion shield.
- 2.80.2 Electric Requirements



## 11000 - Equipment

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Motor shall be enclosed and ventilated and not less than H.P. specified by the Contracting Officer, 3 phase, 208 volt. Provide magnetic type starter completely wired to outlet box on motor. Electric contractor to supply solid connection.

### 2.81 Mixer, Table type (Large and Small)

2.81.1 The Mixers shall be set on table at location as directed by the Contracting Officer and shall be provided with the required accessories. Mixers shall be secured to table top with stainless steel bolts or screws.

#### 2.81.2 Electric Requirements

The motor shall be single phase, 120 volt of enclosed type design, furnished with built-in operation switch and 6 feet of flexible rubber covered 3-wired cord (one for grounding frame of machine) with plug to match receptacle.

### 2.82 Food Cutter

#### 2.82.1 General

The food cutter shall be set on table at location to match existing or as directed by the Contracting Officer and shall be provided with accessories.

2.82.2 The machine shall have a built-in safety device that will positively prevent raising the bowl guard while the motor is in operation, or starting the motor unless the bowl guard is securely locked in place.

#### 2.82.3 Electric Requirements

Motor shall be single phase, 120 volt of enclosed type design, furnished with safety control, operating switch and 6' of approved rubber covered flexible 3-wire cord (one for grounding frame of machine) with plug to match receptacle.

### 2.83 Slicing Machine, Table Type

#### 2.83.1 General

Slicing machine shall be of the manufacture and model number to match the existing or as directed by the Contracting Officer, and shall be lagged to table as shown on drawings. The machine shall be of the manufacturers standard finish except if specified otherwise.

#### 2.83.2 Mechanical Requirements

The motor shall be of the fully enclosed type, lubricated for life. Mechanism shall be of the all gear type fully enclosed, containing lifetime lubrication.

#### 2.83.3 Electrical Requirements

Motor shall be single phase 120 volts, 60HZ, furnished with built-in on-off switch, power indicator light, and a size (6) ft of heavy duty three conductor (one grounding) power cord with a plug to match receptacle.

### 2.84 Dishwashers, General

2.84.1 Dishwashers shall be of the heavy duty commercial type of a manufacture and model number to match the existing or as directed by the Contracting Officer. Machine shall be fully automatic, of size,



design, construction and material as hereinafter specified. Dishwasher installation shall include clean and dirty dish tables.

2.84.2 Dishwasher shall be classified as follows:

- Type A - Door Type, Single Tank
- Type B - Conveyor Type, Single Tank
- Type C - Conveyor Type, Two Tank

2.84.3 Dishwasher Tables

2.84.3.1 Soiled and clean dish tables of the size and shape indicated on drawing shall be furnished. Tables shall be constructed with a stainless steel top, supported on a stainless steel tubing frame and provide with metal undershelving as herein specified and to match the existing or as directed by the Contracting Officer..

2.84.3.2 Table tops shall be fabricated with as few sheets as possible (84" lengths or longer preferred). No longitudinal joints will be permitted. All outside edges shall be constructed with integral rolled or channel shaped edge. All horizontal and vertical corners shall be rounded, welded, ground smooth and polished.

2.84.3.3 All shop transverse joints shall be butt welded, ground smooth and polished. Field transverse joints where necessary shall be carefully aligned and reinforced with a strap of the same gauge and material as the top. Final welding of joint shall be as specified by this specification.

2.84.3.4 The table top shall be reinforced along the longitudinal center line with channels of the same gauge and material as the top and shall be welded to the underside of the top. Transverse channels of the same gauge and material as the top shall be provided for attaching tubing leg sockets. These channels shall be spot welded to table top.

2.84.3.5 The soiled dish table top shall be provided with a splash back along the rear of the height noted on drawing and with pre-wash or soak sink bowl with quick opening lever handle waste as indicated on drawing. The table shall be pitched to the sink bowl. The soil dish table shall also be provided with a large angled plastic scrap block as shown on the drawings. When a pass through window is provided, this Contractor shall secure end of soiled dish table to window sill as shown on detail.

2.84.3.6 Clean dish table - "EL" shaped portion with radius corner shall be depressed 2" x 27" wide inside, with square corners. This section shall be fitted with a 1-1/2" I.P.S. chrome Plated Brass waste outlet with 4" long chrome plated tailpiece where indicated on drawing and extended to spill onto floor drain.

2.84.3.7 Provide removable splasher guards, front and back where tables adjoin conveyor type dishwashing machine approx. 10" long by 13" high of 12 gauge stainless steel. Guards shall be provided with clips or guides to fit curvature of table edge, and exposed corner shall be rounded to a 3 inch radius. When back splasher is indicated the guard shall be omitted at that point.

2.84.3.8 The soiled and clean dish table top shall be constructed with a flange or lip of correct width and shape to make a neat and watertight connected to the dishwashing machine.

2.84.3.9 Metal Undershelving

The clean dish table shall be provided with shelves in sections the full length of each table as indicated on the drawing. No shelves shall be provided under soiled dish table unless otherwise directed.





## 11000 - Equipment

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### 2.84.3.10 Table Supports

- a. Legs shall be provided with stainless steel sockets at the stop. The sockets shall be welded to the transverse channels of the table top and secured to the legs by welding. The legs shall be provided with adjustable stainless steel feet spaced not more than 5'0" on centers.
- b. The soiled dish table top shall be supported on brackets similar to sink and with front legs secured to floor with stainless steel bolts to match existing conditions or as directed by the Contracting Officer.

2.84.3.11 Dishwash table, pre-wash sink shelving and racks shall be provided as part of dishwashing machine installation unless indicated otherwise. Machine shall be right hand, left hand feed direction, corner type or straight, to match existing conditions or as directed by the Contracting Officer.

### 2.84.3.12 Scrape Sink

- a. Scrape sink shall be built into dirty dish table and be of a size and construction to match existing conditions or as directed by the Contracting Officer. All joints welded and ground.
- b. Provide and install on wall behind sink, a pre-rinse faucet with wall bracket and flexible spray head.

### 2.84.3.13 Wall Shelves

- a. Provide and install on wall behind clean and dirty tables two (2) sloped walled shelves with 1" turned up edges.
- b. Shelves shall be of stainless steel construction, 22" deep x 42" wide except if otherwise directed..
- c. Shelves shall be securely lagged to the wall and have bent angle supports on each and all corners shall be wall rounded and polished.

### 2.84.3.14 Racks

- a. Racks shall be provided of heavy duty high impact resistance polypropylene plastic construction of a quantity, type, and manufacture to match existing or as directed by the Contracting Officer.
- b. Racks shall be 20" x 20" in size, of stacking design, except if indicated otherwise directed.

### 2.84.3.15 Approvals

All dishwasher machines must be UL and NSF approved.

### 2.85 Dishwasher, Door, (Type A)

2.85.1 Dishwasher installation shall be as specified, of right hand, or left hand feed, straight or corner design to match existing or as directed by the Contracting Officer. Machine shall be of rigid construction, quiet in operation and shall be free from objectionable vibration. All parts requiring adjustment or lubrication shall be readily accessible from the front of the machine. Machine parts shall be accurately made to insure complete interchangeability and parts subject to wear shall be readily replaceable. All machine parts exposed to water shall be of stainless steel or equivalent non-corrosive material. Machine shall be designed to provide circulating wash and fresh water rinse, the final rinse using outside water supply.





- 2.85.2 Pump shall be of the horizontal, non-clogging centrifugal type with non-overloading characteristics and mounted below the wash tank. The pump casing shall be of cast iron and provided with removable clean-out characteristics and mounted below the wash tank. The pump casing shall be of cast iron and provided with removable clean-out plate accessible from the front or end of the machine for access to the interior parts. The impeller shall be made of Monel metal or stainless steel, hydraulically and mechanically balanced, and shall be mounted on and keyed to a motor shaft of non-corrosive metal, and turn in ball bearings. Suitable means shall be provided for maintaining the impeller in proper lateral position relative to the casing. The packless seal (or stuffing box, glands and renewable packing) shall include a renewable bronze or stainless steel sleeve mounted on the pump shaft. The pump casing shall be provided with a drain unless of self-draining type.
- 2.85.3 The pump and motor shall be directly connected with impeller mounted on the extended shaft of the motor, or by other method approved by the Contracting Officer. The pump and motor shall be placed under the wash chamber and the front enclosed with a stainless steel panel removable without the use of tools.
- 2.85.4 Base and supports shall be of iron or steel or rigid construction and machine shall be mounted on four stainless steel adjustable sanitary legs.
- 2.85.5 Wash Chamber (Housing)
- These members shall be constructed on stainless steel, welded and braced with stainless steel angles on the inside, and of the gauges noted hereafter. The wash-chamber shall be made of stainless steel not less than 18 gauge (.050").
- 2.85.6 Sliding Doors
- Doors of wash chamber shall be of one piece construction, and doors shall slide vertically in grooves. Doors shall be constructed of not less than 20 gauge (.037) stainless steel or monel metal and shall be splash proof and counter-balanced. Each door shall be equipped with unbreakable handles made of heat and water resisting material. The chains and pulleys for doors shall be made of bronze or other material approved by the Contracting Officer.
- 2.85.7 Tank
- The tank shall be constructed of not less than 16 gauge (.0625") stainless steel. The tank shall be equipped with an overflow and a waste outlet provided with a drain valve operated from the outside of the machine. Drain valve shall be brass or non-corrosive material. The waste outlet and the overflow shall be connected together to provide a combination waste and overflow mounted on the exterior of the tank. The tank shall be fitted with suitable metal strainers and lift handles. Strainers shall be constructed with Stainless Steel frame and shall have a perforated or woven stainless steel mesh.
- 2.85.8 Wash Spray System
- 2.85.8.1 Wash spray system shall consist of pipes, arms and manifolds, which shall be of Stainless Steel, Ni-Resist or bronze and arranged to properly spray from above and below. The slotted portion of wash spray piping shall be stainless steel. The wash spray shall cover the entire area of the disk rack. Provide wire brush for cleaning tubes.
- 2.85.8.2 Inlet for water supply shall be located at least 1" above the rim of the dish table, or through air-gap and suds trap and supplied with a shut-off valve at inlet connection of machine, for filling tank. The rinse



## 11000 - Equipment

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pipng shall include check valve and vacuum breaker with extended overflow discharge pipe and discharge extended into wash chamber housing.

### 2.85.9 Control Valves

The final rinse water shall be controlled by a self-closing or solenoid bronze valve having removable nickel alloy or a stainless steel seat operated by means of a timer. A separate valve or switch shall be provided to fill the wash tank.

### 2.85.10 Thermometers

A thermometer shall be provided on the hot water supply to show the temperature of the rinse water. There shall also be a thermometer of either the dial or straight or angle type installed in the wash tank. Thermometers shall have a range of from 50 to 212 degrees F and shall be installed in such location as to be easily read.

### 2.85.11 Automatic Timer Control

2.85.11.1 The machine shall be fully automatically time controlled, timing device shall include an interlock of the doors to prevent opening until finish of complete cycle, and a signal light to indicate when the cycle is in operation.

2.85.11.2 The automatic time control shall be provided with a manually operated auxiliary circuit, which can be used in case of automatic timer failure.

2.85.11.3 The wash, pause, and rinse, shall automatically operate through synchronous timers (electrically or mechanically operated by means of cams) for periods that comply with the requirements of the Contracting Officer.

### 2.85.12 Electric Requirements for Automatic Time Control

The electric timing device apparatus shall be designed for 208 volts, the phase operation. Furnish and install on or near machine a time control switch box with a timing device complete with magnetic starter and overload protection and necessary length of approved waterproof cable in flexible conduit between control switch box and motor outlet box; also to electrically rinse valve. Control switch box shall be provided with opening 3/4" conduit connection.

### 2.85.13 Tank Heating

2.85.13.1 Tank shall be provided with electric or gas heating as specified to match existing or as directed by the Contracting Officer. Electrically heated tanks shall be furnished with a thermostatically controlled electric heater composed of three elements, for 208 volt, three phase, three wire circuit operation. Furnish and install a combined thermostat and limit control. The electric heater shall not be less than the capacity specified, and shall thermostatically maintain the temperature of the wash water at 150 degrees F. The heating elements shall be of the immersion type with stainless steel pheths and shall be the equal of "Chromolox," manufactured by Edwin L. Wiegand Co., Pittsburgh, Pa. The combined thermostat and limit control shall be double pole, single throw, 25 amp. 250 volt AC set for 150 degree F at factory, the equal of Robersshaw Thermostat Co., Model No. H-14 with signal light, stuffing box, manual reset, pointer temperature indicator (not Bezel type) with Type "S" temperature adjustment and mounted in an enameled steel box. The thermostat and heating element shall be completely wired with wires terminating in an outlet box on heater or thermostat.



2.85.13.2 Electrical Contractor will furnish a separate 208 volt, three phase, three wire, heater circuit from source of supply to a flush mounted disconnect switch with signal light, and through the wall outlet box in back of dishwasher, connect this switch to heater outlet box installed on dishwasher. All circuits to be run in conduit.

2.85.13.3 Gas type tank heater shall be of the safety pilot type, with rear mount flue, AGA approved and with accordance with par. 2.85.13.

### 2.85.14 Electric Requirement for Motors

Motors shall be 208 V 3 phase ball bearing fully grease packed design.

This contractor shall terminate all wiring for motor, heater, timer and solenoid rinse valve outlet boxes tapped for 3/4" conduit.

NOTE: Motor starter shall be included with Automatic Time Controller. Contractor will furnish and install a 208 volt, three-phase circuit from source of supply to a flush wall disconnect switch with signal light for motor and a separate circuit for heater and extend and connect to timer control switch box and outlet box on heater.

### 2.86 Dishwasher, Conveyor, (Type B)

2.86.1 Dishwasher installation shall be as specified, of right hand or left hand feed, straight or corner design to match existing or as directed by the Contracting Officer, machine shall be of rigid construction, quiet in operation, quiet in operation and shall be free from objection vibration. All parts requiring adjustment or lubrication shall be readily accessible from the front of the machine. Machine parts shall be accurately made to insure complete interchangeability and parts subject to wear shall be readily replaceable. All machine parts exposed to water shall be of stainless steel, or equivalent non-corrosive material. Machine shall be designed to provide circulating wash and fresh water rinse, the final rinse using outside water supply.

2.86.2 Pump shall be of the horizontal, non-clogging centrifugal type with non-overloading characteristics and mounted below the wash tank. The pump casing shall be of cast iron and provided with removable clean-out plate accessible from the front or end of the machine for access to the interior parts. The impeller shall be made of monel metal or stainless steel, hydraulically and mechanically balanced, and shall be mounted on and keyed to a motor shaft of non-corrosive metal, and turn in ball bearings. Suitable means shall be provided for maintaining the impeller in proper lateral position relative to the casing. The packless seal (or stuffing box, glands and renewable packing) shall include a renewable bronze or stainless steel sleeve mounted on the pump shaft. The pump casing shall be provided with a drain unless of self-draining type.

### 2.86.3 Pump and Motor Connections

The pump and motor shall be directly connected with impeller mounted on the extended shaft of the motor, or by other method approved by the Contracting Officer. The pump and motor shall be placed under the wash chamber and the front enclosed with a stainless steel panel removable without the use of tools.

### 2.86.4 Base and Supports

Base and supports shall be of iron or steel rigid construction and machine shall be of iron or steel or rigid construction and machine shall be mounted on four stainless steel adjustable sanitary legs.



## 11000 - Equipment

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### 2.86.5 Wash Chamber (Housing)

Shall be provided with curtains front and back, inspection and clean-out doors, made of not less than 16 gauge stainless steel.

### 2.86.6 Conveyor

The conveyor shall be operated by lever or motor operated by independent switch, and have normal and neutral speed, allowing racks to remain in machine as required. There shall be an automatic release to stop conveyor if racks accumulate. All parts of conveyor within the hood shall be non-corrosive materials.

### 2.86.7 Separate hot and cold water control valves may be provided on pre-wash tank supplies for manual mixing of pre-wash water.

### 2.86.8 Tank

The tank shall be constructed of not less than 16 gauge (.0625") stainless steel. The tanks shall be equipped with an overflow and a waste outlet provided with a drain valve shall be brass or non-corrosive material. The waste outlet and the overflow shall be connected together to provide a combination waste and overflow mounted on the exterior of the tank. The tank shall be fitted with suitable metal strainers and lift handles. Strainers shall be constructed with Stainless Steel frame and shall have a perforated or woven stainless steel mesh.

### 2.86.9 Wash Spray System

#### 2.86.9.1 Wash spray system shall consist of pipes arms and manifolds, which shall be of Stainless Steel, Monel or bronze and arranged to properly spray from above and below. The slotted portion of wash spray piping shall be stainless steel. The wash spray piping shall be provided with accessible clean-out caps, removable without the use of tools. The wash spray shall cover the entire area of the dish rack. Provide wire brush for cleaning tubes.

#### 2.86.9.2 Inlet for water supply shall be located at least 1" above the rim of the dish table, or through air-gap and suds trap and supplied with a shut-off valve at inlet connection of machine, for filling tank. The rinse piping shall include check valve and vacuum breaker with extended overflow discharge pipe and discharge extended into wash chamber housing.

### 2.86.10 Control Valves

The final rinse water shall be controlled by a self-closing or solenoid bronze valve having removable nickel alloy or a stainless steel seat operated by means of a timer. A separate valve or switch shall be provided to fill the wash tank.

### 2.86.11 Thermometers

A thermometer shall be provided on the hot water supply to show the temperature of the rinse water. There shall also be a thermometer of either the dial or straight or angle type installed in the wash tank. Thermometers shall have a range of from +500 degrees F to +212 degrees F and shall be installed in such location as to be easily read.

### 2.86.12 Automatic Timer Control



- 2.86.12.1 The machine shall be fully automatically time controlled, timing device shall include an interlock of the doors to prevent opening until finish of complete cycle, and a signal light to indicate when the cycle is in operation.
- 2.86.12.2 The automatic time control shall be provided with a manually operated auxiliary circuit, which can be used in case of automatic timer failure.
- 2.86.12.3 The wash, pause, and rinse, shall automatically operate through synchronous timers (electrically or mechanically operated by means of cams) for period that comply with the requirements of the Local Health Department.

### 2.86.13 Electric Requirements for Automatic Timer Control

The electric timing device apparatus shall be designed for 208 volts, three phase operation. Furnish and install on or near machine a tie control switch box with a timing device complete with magnetic starter and overload protection and necessary length of approved water proof cable in flexible conduit between control switch box and motor outlet box; also to electrically controlled rinse valve. Control switch box shall be provided with opening 3/4" conduit connection.

### 2.86.14 Tank Heating

- 2.86.14.1 Tank shall be provided with electric or gas heater to match the existing or as directed by the Contracting Officer. Electrically heated tank shall be furnished with a thermostatically controlled electric heater composed of three elements, for 208 volt, three phase, three wire circuit operation. Furnish and install a combined thermostat and limit control. The electric heater shall not be less than the capacity specified by the Contracting Officer and of the type herein specified, and shall thermostatically maintain the temperature of the wash water of 150 degree F. The heating elements shall be of the immersion type with stainless steel sheaths and shall be the equal of "Chromolox," manufactured by Edwin L. Wiegman Co., Pittsburgh, Pa. The combined thermostat and limit control shall be double pole, single throw, 25 amp., 250 volt, A.C. set for 150 degrees F at factory, the equal of the Robertshaw Thermostat Co., Model No. H-14 with signal light, stuffing box, manual reset, pointer temperature indicator (not Bezel type) with Type "S" temperature adjustment and mounted in an enameled steel box. The thermostat and heating element shall be completely wired with wires terminating in an outlet box on heater or thermostat.
  - 2.86.14.2 Contractor will furnish a separate 208 volt, three phase, three wire, heater circuit from source of supply to a flush mounted disconnect switch with signal light, and through the wall outlet box in back of dishwasher, connect this switch to heater outlet box installed on dishwasher. All circuits to be run in conduit.
  - 2.86.14.3 Gas type tank heater shall be of the safety pilot type with rear mounted flue, AGA approved and fully in accordance with Par. 2.86.14.
- ### 2.86.15 Electric Requirement for Motors
- 2.86.15.1 Motors shall be 208 v, 3 phase, of ball bearing, fully grease packed design.
  - 2.86.15.2 The Contractor shall terminate all wiring for motor, heater, timer and solenoid rinse valve in outlet boxes tapped for 3/4" conduit. When a separate conveyor motor is provided it shall be designed for 108 V- 3 phase operation machine shall be furnished completely wired including solenoid valve (if required) and all operating switches, terminating in rear mounted junction box.



## 11000 - Equipment

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2.86.15.3 Contractor will furnish two (2) 208 v, three phase circuits (one for motors and solenoid valve, and the other for wash tank heater if used) to wall disconnect switches and from switches to junction box in wall at back of Dishwasher and extend and connect to outlet boxes mounted on machine.

### 2.87 Dishwasher, Two Tank, (Type C)

2.87.1 Dishwasher installation shall be as herein specified of right hand or left hand free, straight or corner design as shown on drawing, machine shall be of rigid construction, quiet in operation and shall be free from objectionable vibration. All parts requiring adjustment or lubrication shall be readily accessible from the front of the machine. Machine parts shall be accurately made to insure complete interchangeability and parts subject to wear shall be readily replaceable. All machine parts exposed to water shall be of stainless steel, or equivalent non-corrosive material. Machine shall be designed to provide circulating wash and fresh water rinse, the final rinse using outside water supply.

2.87.2 Pump shall be of the horizontal, non-clogging centrifugal type with non-overloading characteristics and mounted below the wash tank. The pump casing shall be of cast iron and provided with removable cleanout plate accessible from the front or end of the machine for access to the interior parts. The impeller shall be made of monel metal or stainless steel, hydraulically and mechanically balanced, and shall be mounted on and keyed to a motor shaft of non-corrosive metal, and turn in ball bearings. Suitable means shall be provided for maintaining the impeller in proper lateral position relative to the casing. The packless seal (or stuffing box, glands and renewable packing) shall include a renewable bronze or stainless steel sleeve mounted on the pump shaft. The pump casing shall be provided with a drain unless of self-draining type.

### 2.87.3 Pump and Motor Connections

The pump and motor shall be directly connected with impeller mounted on four stainless steel adjustable sanitary legs.

### 2.87.4 Base and Supports

Base and supports shall be of iron or steel of rigid construction and machine shall be mounted on four stainless steel adjustable sanitary legs.

### 2.87.5 Wash Chamber (Housing)

Shall be provided with curtains in and inspection and cleanout doors, made of not less than 16 gauge stainless steel.

### 2.87.6 Conveyor

The conveyor shall be operated by lever or motor operated by lever or motor operated by independent switch, and have normal and neutral speed, allowing racks to remain in machine as required. There shall be an automatic release to stop conveyor if racks accumulate. All parts of conveyor within the hood shall be non-corrosive materials.

### 2.87.7 Control Valve

Separate hot and cold water control valves may be provided on pre-wash tank supplies for manual mixing of pre-wash water.

Provide separate valves for filling wash and pre-wash tank.

### 2.87.8 Tanks



Machine shall be of the two tank type with tanks constructed of not less than 16 gauge (.0625") stainless steel, equipped with an overflow and a waste outlet provided with a drain valve operated from the outside of the machine. Drain valve shall be brass or non-corrosive material. The waste outlet and the overflow shall be connected together to provide a combination waste and overflow mounted on the exterior of the tank. The tank overflow mounted on the exterior of the tank. The tank shall be fitted with suitable metal strainers and lift handles. Strainers shall be constructed with Stainless Steel frame and shall have a perforated or woven stainless steel mesh.

### 2.87.9 Wash Spray System

2.87.9.1 Wash spray system shall consist of pipes arms and manifolds, which shall be of Stainless Steel, or bronze and arranged to properly spray from above and below. The slotted portion of wash spray piping shall be stainless steel. The wash spray piping shall be provided with accessible clean-out caps, removable without the use of tools. The wash spray shall cover the entire area of the dish rack. Provide wire brush for cleaning tubes.

2.87.9.2 Inlet for water supply shall be located at least 1" above the rim of the dish table, or through air-gap and suds trap and supplied with a shut-off valve at inlet connection of machine, for filling tank. The rinse piping shall include check valve and vacuum breaker with extended overflow discharge pipe and discharge extended into wash chamber.

### 2.87.10 Control Valves

A thermometer shall be provided on the hot water supply to show the temperature of the rinse waters. There shall also be a thermometer of either the dial or straight or angle type installed in the wash tank.

### 2.87.11 Thermometers

A thermometer shall be provided on the hot water supply to show the temperature of either the dial or straight or angle type installed in the wash tanks. Thermometers shall have a range of from +50 degrees F to +212 degrees F and shall be installed in such location as to be easily read.

### 2.87.12 Automatic Timer Control

2.87.12.1 The machine shall be fully automatically time controlled, timing device shall include an interlock of the doors to prevent opening until finish complete cycle, and a signal light to indicate when the cycle is in operation.

2.87.12.2 The automatic time control shall be provided with a manually operated auxiliary circuit, which can be used in case of automatic timer failure.

2.87.12.3 The wash, pause, and rinse, shall automatically operate through synchronous timers (electrically or mechanically operated by means of cams) for period that comply with the requirements of the Contracting Officer

### 2.87.13 Electric Requirements for Automatic Timer Control

The electric timing device apparatus shall be designed for 208 volts, three phase operation. Furnish and install on or near a machine a time control switch box with a timing device complete with magnetic starter and overload protection and necessary length of approved water proof cable in flexible conduit between control switch box and motor outlet box; also to electrically controlled rinse valve. Control switch box shall be provided with opening for 3/4" conduit connection.





## 11000 - Equipment

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### 2.87.14 Tank Heating

2.87.14.1 Tanks shall be provided with electric or gas heater to match existing or as directed by the Contracting Officer. Electrically heated tanks shall be furnished with a thermostatically controlled electric heater composed of three elements, for 208 volt, three phase, three wire circuit operation. Furnish and install a combined thermostat and limit control. The electric heater shall not be less than the capacity specified by the Contracting Officer and of the type herein specified, and shall thermostatically maintain the temperature of the wash water at 150 degrees F. The heating elements shall be of the immersion type with stainless steel sheaths and shall be the equal of "Chromolox," manufactured by Edwin L. Wiegand control shall be double pole, single throw, 25 amp. 250 volt AC set for 150 degrees F at factory, the equal of the Robertshaw Thermostat Co., Model No. H-14 with signal light, stuffing box, manual reset, pointer temperature indicator (not Bezel type) with Type "S" temperature adjustment and mounted in an enameled steel box. The thermostat and heating element shall be completely wired with wires terminating in an outlet box on heater or thermostat.

2.87.14.2 Contractor will furnish a separate 208 volt, three phase three wire, heater circuit from source of supply to a flush mounted disconnect switch with signal light, and through the wall outlet box in back of dishwasher, connect this switch to heater outlet box installed on dishwasher. All circuits to be run in conduit.

2.87.14.3 Gas type tank heater shall be of the safety pilot type, with rear mounted flue, AGA approved and fully in accordance with Par. 2.87.14.

### 2.87.15 Electric Requirement for Motors

2.87.15.1 Motors shall be 208V, 3 phase of ball bearing fully grease packed design.

2.87.15.2 Contractor shall terminate all wiring for motor, heater, timer and solenoid rinse valve in outlet boxes tapped for 3/4" conduit. When a separate conveyor motor is provided it shall be designed for 208 V-3 phase operation machine shall be furnished completely wired, including solenoid valve, (if required) and all operating switches, terminating in new mounted junction box.

2.87.15.3 Contractor will furnish two 208 volt, three phase circuits (one for motors and solenoid valve, and the other for wash tank heater (if used) to wall disconnect switches and from switches to junction box in wall at back of dishwasher and extend and connect to outlet boxes mounted on machine.

### 2.88 Dishwasher, Undercounter, Heavy Duty

2.88.1 Unit shall be of the commercial heavy duty type, designed for use as an undercounter component.

2.88.1.2 Machine shall be of stainless steel construction with internal electric rinse water temperature booster and vacuum breaker.

2.88.3 Motors shall be of manufacturers standard recommended horsepower 120 volt, 60 HZ, single phase. Provide rear mounted electrical junction box for connection by others.

### 2.89 Hood Fire Control System

2.89.1 System shall be of the fixed nozzle, dry chemical type, designed to extinguish cooking equipment fires under exhaust hood. System shall be all mechanically operated with operation initiated by a fusible link temperature detector which on temperature rise, causes a carbon dioxide propellant tank to puncture, forcing dry chemical through distribution piping to nozzles located in exhaust duct, plenum and over cooking appliances.





## 11000 - Equipment

- 2.89.2 System shall be fully installed by the kitchen contractor with the exception of the installation of the cable actuated gas main valve which shall be supplied to the plumbing contractor by the kitchen contractor for his installation.
- 2.89.3 Installation of system shall include a three (3) year service/inspection contract that shall commence of day of acceptance. All exposed piping shall be chrome sleeved.
- 2.89.4 Not Used
- 2.89.5 Contractor shall provide and/or install the following with fire control system:
- a. Two (2) demountable metal frames, 8-1/2" x 11" in size, with glass faces, to be secured to the wall outside of main entrance to kitchen. Frames to be mounted with 11" side in vertical, approx. 60" above floor. Contractor shall insert notices in these frames supplied by the Contracting Officer concerning hood use.
  - b. One (1) fire extinguisher with 40 BC rating-capacity 10 lbs. to be mounted on wall in kitchen at a suitable location, 60" above floor. Fire extinguisher shall be a Badger Mod B 10A or other of equal rating and capacity.
- 2.90 Bun Toaster, Portable
- 2.90.1 Unit shall be of the make and model to match existing or as directed by the Contracting Officer, designed to toast hamburger buns in quantity. Toaster shall be equipped with vertical conveyor belt, speed control, manual advance knob, and heated drop pan.
- 2.90.2 Toaster shall have manufacturer standards 120 volt, 60 HZ, 1 phase motor and 120/208 volt, 60 HZ 1 phase heater. Provide six (6) ft. heavy duty three conductor (one grounding) line cord with plug to match receptacle.
- 2.91 Warmer, French Fry (Portable)
- 2.91.1 Unit shall be of the manufacture and model to match existing or as directed by the Contracting Officer, designed to maintain temperature of french fries awaiting serving. Unit shall have overhead glow rod heater, infinite heat control, heated base, and be size to accept 12" x 20" pans.
- 2.91.2 Unit shall be of the manufacturers standard kilowattage, 120 volts, 60HZ, 1 phase. Provide six (6) ft. heavy duty three conductor (one grounding) line cord with plug to match receptacle.
- 2.92 Corn Popper on Base (Mobil)
- 2.92.1 Unit shall be of the manufacture and model to match existing or as directed by the Contracting Officer designed to pop corn and display it for sale. Corn popper shall have Plexiglas cabinet with door, illuminated sign, heat lamp, stainless steel corn popping pan and storage cabinet base supported on four (4) heavy duty casters.
- 2.92.2 Popper shall be of the manufacturers standard kilowattage, 120 volts, 60HZ, 1 phase. Provide six (6) ft. heavy duty three conductor (one grounding) line cord with plug to match receptacle.
- 2.93 Hot Display Cabinet on Base (Mobile)
- 2.93.1 Unit shall be of the manufacturer and model to match existing or as directed by the Contracting Officer designed to keep food items hot and display for sale. Hot cabinet shall have Plexiglas cabinet with



## 11000 - Equipment

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door, three shelves, light, heater with controls and storage cabinet base supported on four (4) heavy duty casters with locks.

2.93.2 Hot cabinet shall be of the manufacturers standard kilowattage, 120 volts, 60 HZ, 1 phase. Provide six (6) ft. heavy duty three conductor (one grounding) line cord with plug to match receptacle.

### 2.94 Salad Bar (Mobile)

2.94.1 Unit shall be of manufacture, model number and size to match existing or as directed by the Contracting Officer designed to hold various salad items to facilitate salad self-service. Server shall be of stainless steel construction with refrigerated cold pan intended for two side service.

2.94.2 Provide full length canopy of double sloped (non-curved) 1/4" thick Plexiglas panels framed in stainless steel "U" edges with 1/2" (min.) radii at each corner. Supply complete with two (2) complete sets of salad bowls and salad ingredient pans with corners.

2.94.3 Refrigerator shall meet all requirements of Pars. 2.1.3 and 2.1.4 and be of the manufacturers standard horsepower, 120 volts, 60HZ 1 phase. Provide six (6) ft. heavy duty three conductor (one grounding) line cord with plug to match receptacle.

### 2.95 Sandwich Unit

2.95.1 Sandwich Unit shall be of stainless steel construction, similar to the model number and size to match existing or as directed by the Contracting Officer.

2.95.2 Unit shall have mechanically refrigerated pan per Par. 07 of this section, with polyurethane insulation. Provide with ingredient pan top, carving board, sliding door cabinet base and full length rotating pan cover. Supply two (2) full sets of pans.

2.95.3 Unit shall be designed for 120 volt single phase operation; motor horsepower as recommended by manufacturer. Provide six (6) ft. heavy duty three conductor (one grounding) line cord with plug to match receptacle.

### 2.96 Proofer

2.96.1 The cabinet shall be similar to the model number to match existing or as directed by the Contracting Officer complete with thermostatically controlled heating unit, removable tray slide for 18" x 26" trays, moisturizer, and 5" dia. full swivel casters with non-marking polyurethane tires.

2.96.2 The entire body of the cabinet, including door, shall be fabricated of aluminum, and insulated with high density fiberglass.

The frame shall consist of special extruded shapes. Door and back shall be reinforced with heavy aluminum bar or channel. Pan support angles shall be of special alloy aluminum, and spaced 3" on centers. Door hinges and door latches shall be of nickel plated steel. No lock required.

2.96.3 The heating unit shall be mounted at the bottom of the cabinet and shall consist of a formed tubular water-proof element and a lifetime lubricated fan assembly. The unit shall have "UL" approval, with thermostat, and pilot light, mounted on front panel. The Unit shall operate on a 120 volt, single phase circuit and shall be equipped with a non-twist lock receptacle, 3 wire connector, 8 ft.. of 3-wire cord and plug. Wattage to be 600 watts (approximately).

### 2.97 Mobile Truck



## 11000 - Equipment

- 2.97.1 The truck shall be similar to the existing model or as directed by the Contracting Officer and shall be of stainless steel construction with two superstructure shelves, and two bottom shelves.
- 2.97.2 Work surface to have back edge raised 1-1/4" inches. Bottom two shelves to have a 10" and 12" clearance, respectively, and shall have all edges turned down 1". Shelves shall be supported by one piece angle steel "U" frames. All shelf edges to be hemmed.
- 2.97.3 Truck shall be mounted on two 5" heavy duty double-ball bearing swivel caster and two 8" double-ball bearing stationary wheels, two with brakes and removable polyurethane tires.
- 2.98 Tray Truck
- 2.98.1 Truck shall be similar to existing model or as directed by the Contracting Officer. Unit shall be of all stainless steel construction with five (5) shelves. Top shelf shall have all edges turned up and have "H" type reinforcement. Other four (4) shelves shall be turned up on one (1) side and both ends. The other side shall be turned down.
- 2.98.2 Trucks shall have four (4) wheels; two (2) 5" diameter. swivel casters with brakes. The other two (2) wheels shall be 8" in diameter., and fixed. All caster and wheels shall have removable polyurethane tires. Handle shall have donut bumpers; and encircling rubber bumper shall be provided.
- 2.99 Dish Truck
- 2.99.1 Truck shall be of all stainless steel tubular construction. Similar to existing model or as directed by the Contracting Officer. All joints shall be welded & ground.
- 2.99.2 Unit shall be of the open shelf type, number of shelves as specified on drawing. Truck shall have two (2) handle bars and wrap around bumpers.
- 2.99.3 Unit shall have four (4) - 5" Diameter swivel casters two with brakes. Casters shall have heavy duty polyurethane tires.
- 2.100 Roll Warmer
- 2.100.1 Warmer shall be of stainless steel construction similar to the existing model or as directed by the Contracting Officer.
- 2.100.2 Unit shall contain the number of electrically heated drawers shown on drawing. Each drawer shall be equipped with a thermostatic control with red pilot light.
- 2.100.3 Roll warmer shall be 208 volts, single phase, provided with solid electrically connection by other contractor.
- 2.101 Silverware Dispenser
- 2.101.1 Dispenser shall be of stainless steel construction similar to the existing model or as directed by the Contracting Officer.
- 2.101.2 Unit shall be separate or built in to counter top as shown on drawings. A separate unit shall be provided with four (4) heavy duty casters, all with locks. Casters shall be 5" dia. (min.) provided with polyurethane tires.
- 2.101.3 Provide two (2) full sets of perforated nylon plastic silverware holding cylinders with each dispenser.
- 2.102 Tray Dispenser



## 11000 - Equipment

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- 2.102.1 Tray dispenser shall be of stainless steel construction similar to the existing model or as directed by the Contracting Officer.
- 2.102.2 Dispenser shall be of open tubular stainless steel construction with all joints welded and ground smooth. Unit shall be mounted on four (4) all swivel polyurethane tired casters (two with brakes) and have wrap around bumper. Self leveling types shall have springs calibrated to suit size and weight of trays used.
- 2.102.3 Provide two (2) full sets of perforated nylon plastic silverware holding cylinder with each dispenser.
- 2.103 Combination Tray/Silverware Dispensers
- 2.103.1 Tray/silverware dispenser shall be of stainless steel construction similar to the existing model or as directed by the Contracting Officer.
- 2.103.2 Shall be of open tubular stainless construction with all joints welded and ground smooth. Unit shall be mounted on four (4) all swivel polyurethane tired casters (two with brakes) and have a wrap around bumper.
- 2.103.3 Provide two (2) full sets of perforate nylon plastic silverware holding cylinder with each dispenser.
- 2.104 Cabinet Unit with Sink
- 2.104.1 General
- 2.104.1.1 The required work under this paragraph shall consist of furnishing all the labor an materials necessary to provide a cabinet with sink top and all required accessories of a size, type and location as shown on drawings.
- 2.104.1.2 Base of cabinet unit shall be made up of undercounter units of manufacture, type and size to match the existing or as directed by the Contracting Officer. Cabinets shall be of 24" in depth and 34-1/2" high.
- 2.104.1.3 Contractor shall visit the premises before cabinets are installed to verify all dimensions and job condition as soon as rough partition walls are fully erected.
- 2.104.1.4 Contractor shall erect cabinets while tile is being installed or as soon as possible after finish has been applied to walls.
- 2.104.2 Attachment
- This contractor shall furnish and install furring strips of wood or metal for attaching cabinets to the wall. These grounds shall be secured to the wall with toggle bolts in hollow material and expansion bolts in solid material.
- 2.104.3 Cabinets
- 2.104.3.1 Cabinets shall be of the size and style to match the existing or as directed by the Contracting Officer. The entire front frame of the cabinets shall be constructed of channel shaped stiles (top, bottom, and sides) and all corners mitered, welded and ground flush to furnish a rigid frame without visible lips, seams, joints, screws or bolt heads. Door and drawer heads shall fit flush or completely overlap, frame members to provide a flush smooth sanitary vermin-tight cabinet front.



2.104.3.2 Each base cabinet shall be enclosed (back, bottom, and side) and reinforced with gusset plates at corners and laterally braced at top. The inside of cabinets shall be smooth sanitary construction without seams, cracks or crevices where dirt might lodge or vermin enter.

2.104.3.3 All furniture steel used in the construction of the cabinets, etc., shall be prime cold-rolled stretcher-leveled, resquared and oiled sheets not less than 22 gauge (.03125") free of defects, scale and rust. Rack panels may be fabricated of reinforced 24 gauge sheets.

All stainless steel to be cold rolled alloy designated by the trade name, stainless steel, 18-8. (Type 304). The finish of cabinets shall be manufacturer's standard finish and shall be protected against corrosion until ready for use.

When one or both ends of cabinets unit is free standing provide cabinet side closure panel(s) and stainless steel top edging continuing around corner. Cabinet doors and siding shall contain sound deadeners. Cabinet color shall be white except if indicated otherwise on drawing.

2.104.4 Handles, Catches, Etc.

Cabinets shall be provided with heavy duty chrome plated steel rounded type handled all cabinet doors shall have magnetic catches.

2.104.5 Drawers

All drawers are to be furnished with heavy duty type roller supports. Top edge of drawers shall be folded over a minimum of 1/2".

2.104.5 Tops

Tops shall be of one piece 14 gauge stainless steel with 6" integral backsplash and center portion sloped to sink. Size as shown on drawing. Provide 1-1/2" folded over front edge with all joints welded and ground smooth. Unless indicated otherwise on drawing sink shall have 17" x 22" x 7" deep bowl welded in place with all joints welded and ground.

2.104.6 Plumbing and Electrical Work

2.104.6.1 This contractor will furnish and install, sink, swing faucet with aerators and lever controls, American Standard, T&S or equal, and drain with tailpiece. Connection to hot and cold water lines, drain and vent shall be by P&D Contractor. This contractor shall do all cutting of opening required for the proper installation of all plumbing and electrical connections.

2.104.7 Shop Drawings, Etc.

Shop drawings and samples of material, finish and hardware shall be submitted for the approval of the Contracting Officer prior to the starting of all work. Shop drawings and material properly labeled shall be submitted in quintuplicate. If it should be necessary due to job conditions to deviate from the contract drawings, modifications must be included in the shop drawings.

2.104.8 Inspection

All items shall be completely erected and left in perfect working order before final inspection by the Contracting Officer. All items shall be thoroughly adjusted, cleaned, polished, oiled or otherwise finished as required. Equipment shall exhibit no blemishes or imperfections that would either affect the appearance or show defects in construction or in operation of equipment.



## 11000 - Equipment

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### 2.105 Angle Rack

2.105.1 The rack shall be similar to the existing model or as directed by the Contracting Officer, complete with all accessories and pans as noted. The unit shall be constructed of aluminum alloy with riveted or welded joints and shall be mounted on 5" diameter. all swivel double-ball bearing casters, two with brakes, and removable polyurethane tires.

2.105.2 Unless indicated otherwise pan supports shall be set up for 3" spacing and have a 19 pan (approx.) capacity. Provide five (5) 18" x 26" aluminum pans with each rack, Wearever No. 5312, or approved or equal.

### 2.106 Pot Rack

2.106.1 Rack shall be of heavy duty 16 gauge all stainless steel construction.

2.106.2 Rack shall be die stamped from Type 304 stainless steel sheet with 1-1/2" turned down edges. Corners shall be welded, ground and polished smooth. Lower edge shall be turned up to the inside at least one inch. Center area of shelf shall have full length louvers with large upper corner radii. Shelves shall be adjustable, supported on four (4) .0625" dia. (min.) 16 gauge polished stainless steel tubing.

2.106.3 Shelves shall be completely deburred. Provide unit with five shelves unless indicated otherwise on drawing, and four (4) heavy duty casters, two with locks.

### 2.107 Domestic Type Kitchen Equipment, General

2.107.1 This Contractor shall furnish and install the equipment complete, to match the existing or as directed by the Contracting Officer. All equipment listed in this section shall be furnished in accordance with the following requirements.

2.107.2 Where available, all gas heated equipment shall be provided with electric ignition. When electric ignition is not available safety type pilots will be furnished.

2.107.3 The equipment shall be the latest model of the current year in design, material and workmanship and shall match the existing model or as directed by the Contracting Officer.

2.107.4 The equipment shall match the existing model or as directed by the Contracting Officer, complete with all standard accessories, except as otherwise noted. Extra accessories, when required will be requested by the Contracting Officer, after the model number of hereinafter specified.

2.107.5 Each piece of equipment installed shall be fully demonstrated to the Contracting Officer by a authorized representative of the manufacturer or dealer. Provide a full set of instructional manuals with each piece of equipment.

2.107.6 Equipment, burners, valves, safety pilots and thermostats shall have "American Gas Association" approval. All electrically heated equipment shall comply with the requirement of the Underwriters Laboratory.

2.107.7 Cuts and complete description of all equipment shall be submitted in quintuplicate for the Contracting Officer's approval, before installation.

2.107.8 The finish shall be the manufacturers standard finish, unless otherwise specified. All parts subject to corrosion shall be protected until ready for use. Color shall be to match existing or as directed by the Contracting Officer.



## 11000 - Equipment

- 2.107.9 All equipment fixed in place requiring electrical input connections shall be provided with integral junction box in rear for solid electrical connection.
- 2.107.10 All plumbing connections shall be provided by plumbing contractor.
- 2.108 Dishwasher (Under-Counter Type)
- 2.108.1 The dishwasher shall be of the size, type, and Model number to match the existing or as directed by the Contracting Officer, complete with dish racks and silverware basket.
- 2.108.2 When unit is installed free standing provide and install plastic laminate top section and side closure panels. When unit is installed with one side exposed provide and install proper plastic laminate side closure panel.
- 2.108.3 Electric Requirements
- Motor shall be of manufacturers recommended H.P. 120 volts, 60HZ single phase. Heater shall be approx. 1.5 kW, 120 volts, 60 HZ single phase. Provide junction box for solid electrical connection by other contractors.
- 2.109 Dishwasher, (Undercounter type)
- 2.109.1 Dishwasher shall be of stainless steel construction similar to the existing model or as directed by the Contracting Officer complete with dish racks and silverware basket.
- 2.109.2 When unit is installed free standing provide and install plastic laminate top section and side closure panels. When unit is installed with one side exposed provide and install proper plastic laminate side closure panel .
- 2.109.3 Electric Requirements
- Motor shall be of manufacturers recommended HP 120 volts 60 HZ, single phase. Heater shall be approx. 7.5 kW, 120/208 volts, 60 HZ, single phase. Provide junction box for solid electrical connection by other contractors.
- 2.110 Refrigerator 10 cu. ft.
- 2.110.1 Refrigerator shall be of approx. 10 cu. ft. capacity with single door, freezer compartment and automatic defrost, similar to the existing model or as directed by the Contracting Officer.
- 2.110.2 Motor shall be of the manufacturers recommended HP, 120 volts, 60 HZ, single phase. Provide six (6) ft. three conductor (one grounding) line cord with plug to match receptacle.
- 2.111 Refrigerator, 20 cu.ft.
- 2.111.1 Refrigerator shall be of approx. 20 cu.ft. capacity with single door, freezer compartment and automatic defrost, similar to the existing model or as directed by the Contracting Officer.
- 2.111.2 Motor shall be of the manufacturers recommended HP, 120 volts, 60 HZ, single phase. Provide six (6) ft. three conductor (one grounding) line cord with plug to match receptacle.
- 2.112 Refrigerator, Undercounter
- 2.112.1 Refrigerator, under counter shall be of approx. seven cu. ft. capacity with single door, freezer compartment, and automatic defrost. Unit shall be similar to the existing model or as directed by the Contracting Officer.





## 11000 - Equipment

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- 2.112.2 When refrigerator is installed free standing or with sides exposed, provide and install provide and install proper plastic laminate work top and side closure panels.
- 2.112.3 Motor shall be of the manufacturers recommended HP, 120 volts, 60 HZ, single phase. Provide six (6) ft. three conductor (one grounding) line cord with plug to match receptacle.
- 2.113 Refrigerator-Freezer Combination
- 2.113.1 Refrigerator-Freezer shall be of approx. 20 cu. ft. capacity with tow side by side doors, automatic defrost and mounted on four (4) casters, two with brakes. Unit shall be similar to the existing model as directed by the Contracting Officer.
- 2.113.2 Motor shall be of the manufacturers recommended HP, 120 volts, 60 HZ, single phase. Provide six (6) ft. three conductor (one grounding) line cord with plug to match receptacle.
- 2.114 Range, Gas, 20"
- 2.114.1 Range shall be 20" wide, similar to the existing model as directed by the Contracting Officer. Oven shall be provided with lower full width oven, oven light and safety pilot, electric timer and four (4) open type top burners.
- 2.114.2 Electric requirements shall be 120 volts, 60 HZ, single phase. Provide six (6) ft. three conductor (one grounding) line cord with plug to match receptacle.
- 2.115 Range, Gas 36"
- 2.115.1 Range shall be 30" wide, similar to the existing model as directed by the Contracting Officer. Oven shall be provided with lower 30" wide oven, pot compartment, oven light and safety pilot, electric timer and four (4) open type top burners.
- 2.115.2 Electric requirements shall be 120 volts, 60 Hz, single phase. Provide six (6) ft. three conductor (one grounding) line cord with plug to match receptacle.
- 2.116 Cook Top (Gas)
- 2.116.1 Cook top shall have four (4) gas burners, size as shown on drawing, to be built into existing kitchen countertop unit by this contractor. Installation to be complete, including finishing of countertops if accommodating alterations are required.
- 2.116.2 Electric requirements shall be 120 volts, 60Hz, single phase. Solid electric connection to be provided by other contractor.
- 2.117 Range Electric, 20"
- 2.117.1 Range shall be 20" wide, similar to the existing model number or as directed by the Contracting Officer. Provide with full width lower oven, oven light, control panel and four (4) lift-up type electric burners with porcelain drip bowls.
- 2.117.2 Electric requirements shall be 120/208 volts, 60 Hz, single phase, 7.0 kW (approx.) Solid electric connection by other contractor.
- 2.118 Range Electric, 30"





## 11000 - Equipment

- 2.118.1 Range shall be 30" wide, similar to the existing model number or as directed by the Contracting Officer. Provide with full width lower oven, oven light, control panel and four (4) lift-up type electric burners with porcelain drip bowls.
- 2.118.2 Electric requirements shall be 120/208 volts, 60 Hz, single phase, 7.0 kW (approx.) Solid electric connection by other contractor.
- 2.119 Range Electric, 36"
- 2.119.1 Range shall be 36" wide, similar to the existing model number or as directed by the Contracting Officer. Oven shall be provided with full width lower 30" wide oven, pot compartment, oven light, and safety pilot, electric timer and four (4) open type top burners.
- 2.119.2 Electric requirements shall be 120/208 volts, 60 Hz, single phase, 7.0 kW (approx.) Solid electric connection by other contractor.
- 2.120 Kitchen Units
- 2.120.1 General
- Kitchen Units shall consist of a cabinet sink with integral gas or electric range, refrigerator and full width upper wall cabinets. Larger units shall have ovens, and additional top burner and more cabinetry. Where exposed sides of the unit occur, contractor shall procure and install proper side closure panels as supplied by manufacturer of unit. The requirement of this Paragraph shall apply to all kitchen units.
- 2.120.2 Sink
- Sink and range top shall be continuous, one piece with no crack between sink and range. Top shall have integral back splasher, and when end of unit adjoins a wall the top shall be provided with integral and splasher of the same height as the back splasher. The top shall be of No. 14 gauge steel construction with acid-resisting porcelain finish. The bowl shall be of the Manufacturer's standard size, welded into the top and shall be provided with three (3) 1/2" diameter stainless steel crumb cup strainer; also deck type faucet with aerator.
- 2.120.3 Range
- Range shall consist of two or more electric or gas burners to match existing or as directed by the Contracting Officer. Electric top burners shall be of the monotube tilt-type, each equipped with stainless steel drip bowls. Gas burner units shall be of the removable type, meeting all applicable requirements of Par. 112. Range shall be fully insulated throughout with a minimum of 2" of sealed in place polyurethane or fiberglass. A 120 volt, 15 amp. convenience electric receptacle shall be provided on the front control panel.
- 2.120.4 Refrigerator
- 2.120.4.1 The refrigerator shall be of all steel construction and shall be specially designed so that all service can be done from front, and the complete refrigeration system can be removed for repairs or replacement without removing the refrigerator or any part of the complete Kitchen Unit. The interior shall be finished in acid-resisting porcelain enamel. The entire refrigerator shall be insulated with polyurethane foam. Compressor shall be of the full hermetically sealed, air cooled type and shall have a 5 year warrantee. Refrigeration unit shall be provided with a separate cord and plug from compressor to grounding receptacle provided in separate refrigerator terminal box. Provide refrigerator interior light.



## 11000 - Equipment

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### 2.120.5 Electric Requirements

2.120.5.1 The range elements shall be wired for operation on a 120-208 volt, single phase three-wire circuit. The range shall be completely wired with wires terminating in an outlet box in rear of unit. Electric connections by others.

2.120.5.2 The refrigeration shall be provided with three wire cord (one for grounding frame of machine) and plug similar to Hubbell No. 5264. The motor shall be of the Manufacturer's recommended horsepower suitable for operation on 120 volt, single phase circuit. The circuit for the refrigerator section shall be separate from the range circuit.

### 2.120.6 Cabinets

2.120.6.1 The wall and base cabinets shall be of all texturized steel construction. The space between the underside of cabinets and top of splasher shall be covered with a panel of the same material as the back splasher of the top. When the end of the unit adjoins a wall, a side wall splasher of the same material shall be furnished. The underside of the cabinets shall be covered with an insulated heat deflector above the range unit. Provide a filler between top of cabinets hung ceiling when ceiling is furred down over cabinets. No electric fixture is required under wall cabinets.

2.120.6.2 Provide a cutting board and cutler drawer unit on the bottom shelf of the wall cabinet above the sink or range unit.

### 2.120.7 Finish

The unit including wall cabinets shall be finished in the Manufacturer's standard baked enamel finish and shall be protected against damage and corrosion until ready for use. Color shall be white.

### 2.121 Kitchen Unit, 39" Electric

2.121.1 Kitchen unit shall be 39" wide, of type and model number specified by the Contracting Officer. Unit shall have two top burners, no oven and on 15 amp. convenience receptacle.

2.121.2 Electric requirements shall be 120/208 volts, 60Hz, single phase 4.5 kw. Provide junction boxes for solid connection by others.

### 2.122 Kitchen Unit, 51" (Electric)

2.122.1 Kitchen unit shall be 51" wide, of type and model number to match the existing or as directed by the Contracting Officer. Unit shall have two top burners, no oven and on 15 amp. convenience receptacle.

2.122.2 Electric requirements shall be 120/208 volts, 60Hz, single phase 5.8 kW. Provide junction boxes for solid connection by others.

### 2.123 Kitchen Unit, 60" (Electric)

2.123.1 Kitchen unit shall be 60" wide, of type and model number to match the existing or as directed by the Contracting Officer. Unit shall have three top burners, oven and one 15 amp. convenience receptacle.

2.123.2 Electric requirements shall be 120/208 volts, 60 Hz, single phase 7.9 kW. Provide junction boxes for solid connection by others.

### 2.124 Kitchen Unit, 39" (Gas)



## 11000 - Equipment

- 2.124.1 Kitchen unit shall be 39" wide, of type and model to match the existing or as directed by the Contracting Officer. Unit shall have two top burners, no oven and one 15 amp. convenience receptacle.
- 2.124.2 Electric requirements shall be 120/208 volts, 60 Hz, single phase 2.0 kW. Provide junction boxes for solid connection by others.
- 2.125 Kitchen Unit, 60" (Gas)
- 2.125.1 Kitchen unit shall be 60" wide, of type and model number to match the existing or as directed by the Contracting Officer. Unit shall have three top burners, oven and one 15 amp. convenience receptacle.
- 2.125.2 Electric requirements shall be 120/208 volts, 60 Hz, single phase 2.1 kW. Provide junction boxes for solid connection by others.

### 3.0 EXECUTION

#### 3.1 Workmanship, General

It is the intention of these specifications to cover equipment of the highest standard of workmanship. The materials and workmanship shall be first-class in every respect and the work throughout shall be performed in a thorough workmanlike manner, accurately fitted in place substantially constructed, properly framed and thoroughly reinforced and shall be in perfect condition when installed in building. All equipment shall as far as practical, be fabricated at the factory.

#### Setting Equipment

Unless otherwise herein specified or shown on the drawings, all equipment shall be lined up square with the adjacent walls and shall be set level and even, particularly the counters, sinks, cabinets, shelving, etc.

#### Radius Corners, Brakes, Miters, Joints, Etc.

The Contractor is cautioned that all radius corners or edges must be geometrically regular and consistent and that, unless otherwise specified or shown on the drawings, all square breaks of metals must be made with the smallest possible radius where the break occurs (except in refrigerators, and sink drain boards) and be continuous and regular from the ends toward the center and that the edges of the miters and points must be even and flush, and finished smooth.

#### 3.2 Shop Joints

Where required by sheet sizes, shop joints shall be butt welded with joints ground smooth, presenting a uniform one-piece construction. Butt joints made by spot welding or riveting straps under seams filled with solder and then ground will not be acceptable.

#### 3.3 Field Joints

Field joints where required shall be carefully ground to a hair line fit and reinforced with a metal strip of the same material and gauge as the parts joined. The strip shall be welded to one section of the part. For field fastening the parts shall be placed in perfect alignment and tack welded in position. After making final adjustments, if required joint shall be finish welded, ground smooth and polished.

#### 3.4 Welds and Grinding



## 11000 - Equipment

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Unless otherwise herein specified, all welded corners, joints and connections shall be electrically welded, seamless with the joints invisible, finished smooth to match the adjoining surface. Parts welded are to be made homogeneous and free from imperfections. All joints shall be strong and ductile with exposed excess metal ground off so as not to show points of concentration or deflection at points of grind and the finished surface will simulate one-piece construction. All sharp edges shall be ground smooth and polished.

### 3.5 Soldering/Tinning

3.5.1 Unless otherwise specified herein, solder shall not be used to fill in pits or crevices in stainless steel or to fill in the corners of same.

3.5.2 Whenever tinning is required or specified, the surfaces or parts to be tinned shall be carefully prepared in the best possible manner, and be heavily and thoroughly coated with pure block tin or heavy washed tin as herein specified.

END OF SECTION 11400



## SECTION 11415

### UNIT KITCHENS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of unit kitchens. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS: Electrical components shall comply with applicable UL standards and bear appropriate UL labels. Gas-burning equipment shall comply with ANSI Z21 and shall bear the AGA seal of approval.
- 2.1 Materials: Minimum 22-gauge steel sheet for component body parts, minimum 20-gauge steel sheet for door fronts and liners, and heavier-gauge steel for internal gussets and bracing.
- 2.2 Components: Electrical components shall be wired for the voltage available and shall terminate at factory-installed terminal boxes. Gas-burning components shall be designed to operate on the designated fuel. Unit kitchens shall include the following, as required:
  - 2.2.1 Top and Sink shall be seamless, one-piece with integral back and end splashes fabricated from 18-gauge AISI Type 302/304 stainless steel with No. 4 brush finish or 16 gauge minimum titanium steel with acid resistant porcelain finish. Sink accessories shall include chrome-plated swing spout faucet with aerator, chrome-plated faucet handles, stainless steel cup strainer, and drain outlet with tailpiece.
  - 2.2.2 Food Waste Disposer shall be complete with drain outlet and tail-piece.
  - 2.2.3 Refrigerator and Freezer Compartments shall be the designated minimum capacity measured in accordance with ANSI B38.1.
  - 2.2.4 Range: Each cooktop burner shall be rated at not less than 1,250 watts, if electric, or 8,000 Btu, if gas.
  - 2.2.5 Oven: Electric oven "Bake" operation shall be rated at 2,000 watts minimum and "Broil" operation shall be rated at 2,500 watts minimum; gas oven burners shall be rated at 18,000 Btu minimum.
  - 2.2.6 Cabinets shall be under-counter and upper wall-mounted, with shelves, doors, drawers, and hardware.
- 3.0 EXECUTION (Section not used.)

END OF SECTION 11415



## 11000 - Equipment

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### SECTION 11510

#### GYMNASIUM EQUIPMENT

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of gymnasium equipment. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.01 Manufacturers:
- A. Nissen Corp., Cedar Rapids, Iowa
  - B. Porter Equipment Co., Schiller Park, Illinois
  - C. Or approved equal
- 2.02 Shop Drawings: Submit shop drawings in triplicate showing plan of gym, 1/8" - 1'0" scale, location and method of anchorage of all items and apparatus equipment and materials used, for approval.
- 2.1 Basketball Backstops shall be ceiling-suspended, forward-folding, backward-folding, side-folding, wall-braced or fixed type; wall-mounted up-folding, side-folding or fixed type; or floor-mounted portable type as required. Backstop shall come complete with backboard, goal, and all accessories. Backboard material shall be glass, fiberglass, steel or wood as required and rectangular or fan shaped. Movable backstops shall be manually or electrically operated. Backstops, goals, and their accessories shall meet the specifications of the National Collegiate Athletic Association.
- 2.1.0 Types:
- 2.1.0.0 Stationary Type: Wall suspended and braced if 5'-0" or less from wall.
- a. Two vertical wall pads, if backstops are 4'-0" or less from wall.
  - b. Add one horizontal wall pad, at height adequate to provide suitable angle chain supports if backstops are over 5'-0".
- 2.1.0.1 Stationary Type: Ceiling suspended, wall braced, if over 5'-0" from wall.
- a. Suspend directly from threaded sockets bolted to concrete or steel structure above; or to sockets in supplementary members if structural members are not suitably located for direct suspension. Brace to walls.
  - b. Provide double cross braces for drop pipes and inclined brace pipes if distance between bottom of board and ceiling supports exceeds 13'-0".
  - c. Provide sway braces where height of ceiling supports is excessive.
- 2.1.0.2 Retractable Type ( Backward Fold):



- a. Complete with 3" overhead pipe frame and hoisting winch.
  - b. Attach drop pipes to overhead frame, hinged joint, extend to bottom of board.
  - c. Brace pipes hinged at top, bottom and center, to fold inside. Board to swing backward to horizontal position.
  - d. Reinforce drop and brace pipes for rigidity.
  - e. Locate winch on wall, 7'-0" minimum from floor.
- 2.10.3 Retractable Type (Forward Fold): Construct as specified for backward fold type, except that diagonal brace pipes shall be in one piece and automatically latch to hold backboard in playing position and release without manual adjustment when board is raised.
- 2.1.1 Materials:
- 2.1.1.0 Backboard (Wood) - (48" x 72"):
- a. 1 5/8" thick exterior grade (9-ply) U.S. Plywood with "Lebonex" surface both sides.
  - b. Finish coats egg-shell white, non-glass enamel.
  - c. Install eight (8) expansion type inserts for attaching board to frame.
  - d. Backboard similar and equal to Porter 208.
- 2.1.1.1 Backboards (Glass)- (48" x 72"):
- a. Glass 1/2-inch thick.
  - b. Set into 2" x 2" x 3/16" angle frame.
  - c. Insulate steel face plate (for attachment of goal ring) from glass face of board with shock absorbing pads.
  - d. Install bushings for goal ring bolts.
  - e. Board equal to Porter 232.
- 2.1.1.2 Goal:
- a. Ring 5/8" diameter cold rolled steel.
  - b. Braces 3/8" diameter cold rolled steel.
  - c. Provide attachment plate, 7" square. Weld braces to attachment plate.
  - d. Punch four (4) holes in plate to accommodate attachment bolts. Holes punched on 5" centers vertically and horizontally.
  - e. Goals shall have "no-Tie" clips; finish with an orange enamel. Weight of assembly - 27 lbs.
  - f. Finish a 120-thread sieve twin net with each goal.
  - g. Height of goal rim 10'-0", unless otherwise noted on drawings.
- 2.1.1.3 Suspended Framework, Etc.:



## 11000 - Equipment

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- a. Pipe Standard weight; black steel, sizes as hereinafter specified.
- b. Ceiling Frames 3" - I.D. Mon.
- c. Drop Pipes 2" - I.D. Min.
- d. Horizontal and Diagonal Bracing 1 1/2" - I.D.
- e. Drop pipes and bracing frames, reinforced with steel tension flats, joined at intersection with bolted steel fittings.
- f. All ends of pipe frames with pipe plugs.

### 2.1.1.4 Diagonal Steel Braces:

- a. 1/4" x 1" flats (steel) length required.
- b. Equip with pipe clamps at each end.
- c. Install steel clamps at all brace intersections.

### 2.1.1.5 Cross Braces (X):

- a. 1/4" x 1-1/4" flats (steel) length required.
- b. Equip with pipe clamps at each end.
- c. Install steel clamp at all brace intersections.

### 2.1.1.6 Pipe clamps and Fittings: Two (2) pieces malleable iron or formed steel, required size, bolt together.

### 2.1.1.7 Chain supports:

- a. 3/16" coil-proof, galvanized attached to staple plates.
- b. Furnish additional repair links.
- c. No paint finish required.

### 2.1.1.8 Staple plates:

- a. 5" x 4" x 1/4" steel plate; 3/8" dia. hole each corner.
- b. Staple 1" diameter (min.) closed "U", welded to staple plate.

### 2.1.1.9 Pipe plugs:

- a. Cats iron drive-in type.
- b. Secure in place with set screw, or:
- c. Cap over plug, weld in place.

### 2.1.1.10 Truss-Clamps: Malleable iron, bolted clamp type.

### 2.1.1.11 Wall Brackets:

- a. Malleable iron, bolt to wall pad, cupped to receive supporting pipe.
- b. Lock in place by bolted clamps.





2.1.1.12 Sway Braces:

- a. 11/2" I.D. pipe of design to adequately brace drop pipes.
- b. Secured at both ends by means of hinged type plug and malleable iron hangers.

2.1.1.13 Winch (Cable, Cable Pulleys)

- a. Winch, fully enclosed worm gear type, complete with removal handle.
- b. Winch designed to hold unit at any point and shall also provide sufficient leverage to facilitate easy raising and lowering backstop.
- c. Winch Cable: 5/16" diameter, 6 x 19 plow grade steel wire rope.
- d. Cable Pulleys: Stoweeel type, complete with fittings, wall pads, welded staple plates or truss hangers for attachment, as building conditions may require.

2.1.1.14 Wall Pads:

- a. 2" x 6" lengths as required. See Detail.
- b. Yellow Pine or Douglas Fir.

2.2 Telescoping Bleachers shall be operable bleacher systems of multiple-tired benches on interconnected folding supports, which permit closing, without requiring dismantlement, into a nested relationship for purposes of storing or moving. The bleachers shall be wall-attached, free-standing floor-attached, or free-standing movable type as required. The bleachers shall conform to the applicable requirements of Chapter 9 of NFPA 102. Bleacher seats shall be wood, vinyl-clad steel, or plastic, as required. System shall have row rise and row spacing as desired and shall come complete with end panels, rear fillers, back panels, end railings and back tailings as required. Bleachers shall be manually or electrically operated.

2.3 Gym Divide: Curtains shall be constructed of vinyl for the first eight feet (8' 0") above the floor. The remainder shall be 1-3/4 inch mesh, white nylon netting. A chain or other ballast shall be sewn into the bottom hem. Curtains that are drawn shall be manually operated and glide along their own track. Roll-up curtains shall be power-operated.

2.4 Horizontal Bars:

2.4.1 Fully Guyed (Adjustable):

1. Uprights chrome plated; numbers stamped on in 2" increments allowing for adjustments from 3'-0 to 8'-6"
2. Bar equipped with height adjusting collars with safety lock and hand screw clamps for locking bar in desired position.
3. Furnish and install four (4) guy cable with two (2) standard and two (2) instantaneous turnbuckles, and required floor plates for installation on wood floor or on concrete floor with vinyl covering.
4. Bar shall be similar and equal in construction and quality to #2361 Porter or #213 Nissen.

2.4.2 Semi-Guyed (Adjustable): Identical to fully guyed except for the following:



## 11000 - Equipment

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1. One upright is permanently anchored to wall with cast iron bracket that is attached to a 2" x 4" x 18" wall pad with 3/8" carriage bolts and to floor with cast iron flanges.
2. Two (2) guy cables and required floor plates for wood floors or for concrete floors with vinyl asbestos covering.
3. Bars similar and equal to Nissen #214 or Porter # 2362.

### 2.5 Game Standards (Multipurpose) (Volleyball, Badminton, Tennis):

#### 2.5.1 Types:

1. Standards interchangeable for indoor and outdoor use.
2. Standards as manufactured by Jayfro Athletic Supply Co., New London, Conn., or other approved manufacturer.
3. Standards #6 W.M.P.
  - a. Furnish cross bar slide engraved with official markings for high jump.
  - b. Furnish type "B" aluminum grooved sleeves with cap and cap extension insert for outdoor installation.
4. Standards for indoor use #6 W.C.I. (Jayfro Athletic Supply Co.)
5. Standards: For indoor use, without high jump feature requirements, #5 W.C.I. (Jayfro Athletic Supply Co.)

#### 2.5.2 Uprights:

2" O.D. (min.) heavy duty aluminum pipe 8'-0" long, complete with aluminum base plate and bronze floor plates for indoor installation. Furnish guy wires and extra floor plates for end standards where required.

#### 2.5.3 Nets:

1. Regulation volleyball, length suitable for playing area. Net #12 thread twine equal to #2712 T, Linen Thread Company, tape entire perimeter of net.
2. Provide loop at corners.
3. extend ropes minimum distance of 30-inches from each side of net.

#### 2.6 Striking Bag Drum:

- 2.6.1 Crank adjustable type equal to Nissen #113 or Everlast #4269 equipped with swivel and bag attachment.
- 2.6.2 Sliding post, precision machined and rust proof. Allow for a 16" range of adjustment.
- 2.6.3 Wood platform minimum 3'-0" in diameter, reinforced with two(2) oak cleats to permit attachment of platform to the two metal supporting arms.
- 2.6.4 Adjusting screw mounted on a ball thrust bearing, operated by an extended handle and clamp handle for locking platform in position as required.
- 2.6.5 Attach wall pad to masonry wall with approved bolts.



### 2.7 Training Bag and Supporting Frame:

- 2.7.1 Bag 12" diameter, 40" long, inner bag covering 21-oz. duck, outer covering best grade seating leather.
- 2.7.2 Suspension chain sufficient length to suit height of support frame. Swivel attachment of approved design to permit bag to rotate.
- 2.7.3 Suspend bag to permit 6'-0" clearance from either wall in corner of gym (where selected). Set supporting frame of 6" I-Beams, anchor to masonry walls; also set diagonal brace for "Support" of corner of supporting frame. Anchor brace to masonry.
- 2.7.4 Submit shop drawings showing actual supporting frame.

### 2.8 Climbing Ropes:

- 2.8.1 Four (4) strand selected long fibre manila rope made to be durable and strong.
- 2.8.2 Rope 1 1/2" in diameter, including core. Top end whipped with two (2) ply medium Jute Morlin twine, which shall be encased in a steel stamping by means of six (6) hexagon head screws. Bottom end of rope back spliced with taper for a distance of approximately 15-inches. Each rope shall be equipped with tambouring, fixed in place.

Ropes shall be grouped in sets of four (4) ropes spaced 4'-0" O.C. on 3" I.D. pipe or from individual sockets attached to roof structure.

### 2.9 Peg Board:

- 2.9.1 Constructed of 2" thick Douglas Fir, faced with 1/2" oak or maple plywood, glued together. Board shall be approximately 30" x 30".
- 2.9.2 Aluminum sockets, 1 1/2" O.D., 3/16" minimum wall thickness and 1-7/8" x 3/16" head, set in holes drilled through finished board, spaced 8" O.C. vertically and horizontally. Total sixteen (16) sockets.
- 2.9.3 Board sanded smooth and finished with two (2) coats of shellac or spar varnish.
- 2.9.4 Pegs aluminum, or hardwood, 8" long, 1-1/8" diameter.
- 2.9.5 Secure board to wall, height directed, with 1/2" toggle bolts.
- 2.9.6 Furnish two (2) pegs with each climber.

### 2.10 Chinning Bar:

- 2.10.1 Shall be adjustable in increments of 6" similar and equal to Porter #197.
- 2.10.2 Support brackets to be mounted on yellow pine or Douglas fir wall pads. Pads shall be finished natural, lacquered, and secured to wall with 1/2" toggle bolts passing entirely through wall block.
- 2.10.3 Mount at standard height as determined by the Contracting Officer.

### 2.11 Mat Hooks:

- 2.11.1 Furnish and install on walls of Gymnasium and storerooms where directed.
- 2.11.2 Two (2) hooks are required for mats up to 7'-0" long and three (3) for mats over 7'-0".



## 11000 - Equipment

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- 2.11.3 Base of hook shall be malleable iron, pivoting to wall when not in use.
- 2.11.4 Wood base shall be constructed of either oak or ash, no other wood will be accepted. Size of wood base 1-1/8" x 7-1/2" x 10", with a 3/4" bevel on four sides. Sand base smooth and finish with two (2) coats of clear lacquer.
- 3.0 EXECUTION:
  - 3.0.1 Surface Conditions:
    - 3.0.1.1 Inspection:
      - 1. Prior to work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where fabrication and installation of the work of this Section may properly commence.
      - 2. Make all required measurements in the field to insure proper and adequate fit of items.
    - 3.0.1.2 Discrepancies:
      - 1. In the event of discrepancy, immediately notify the Contracting Officer
      - 2. Do not proceed with fabrication or installation in areas of discrepancy until all such discrepancies have been fully recovered.
  - 3.0.2 Erection:
    - 3.0.2.1 Coordination:
      - 1. Coordinate installation schedule with the schedules of other trades to insure orderly and timely progress of the total work.
      - 2. Placement of equipment relating to floor groove lines shall be coordinated with flooring contractor.
    - 3.0.2.2 Backstops:
      - 1. Wall pads: Secure pads to block wall with 1/2" dia. toggle bolt. Bolts to pass through pad and entire thickness of block wall. Bolts staggered; minimum spacing 18" o
      - 2. Bolt holes neatly drilled. After installation, fill all holes and voids completely with mortar.
      - 3. Ceiling sockets (threaded): Bolt to weld to beam flange or by anchor bolts to poured concrete slab; as required.
      - 4. Floor plates: Rout wood floor for floor plates. Keep minimum clearance around plate.
      - 5. Wall Brace Flanges: Weld to both ends of brace pipe , and secure to wall pads with four (4) carriage bolts proper size, countersunk from rear of wall pad.
  - 3.02.3 Adjustments: Examine installed equipment for proper anchoring and rigidity and correct same.
- 3.1 Basketball Goals shall be securely attached to supporting construction and shall be installed at a height of 10 feet from the rim to the floor.
- 3.2 Telescoping Bleacher Seating: Verify that areas to receive telescoping bleacher seating are free of impediments interfering with installation and operation. Securely attach to supporting construction.



## 11000 - Equipment

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- 3.3 Gym Divider Curtains: Verify that areas to receive gym divider curtains are free from interferences and structurally capable of supporting the curtains.

END OF SECTION 11510



## 11000 - Equipment

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### SECTION 11525

#### FIXED WOOD BLEACHERS (EXTERIOR)

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of fixed wood bleachers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations, Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Hardware, Brackets, Fasteners, and Connectors shall be zinc- coated or hot-dipped galvanized steel or aluminum. Nails, brads, staples, and spikes shall comply with Fed. Spec. FF-N-IO5.
- 2.2 Lumber and Timber Members used for repair or replacement of bleacher components shall be of the species and grades complying with National Design Specification for Stress-Grade Lumber and its Fastenings (National Forest Products Association). Nominal sizes shall comply with PS20. Lumber materials shall bear a mark of recognized inspection agency identifying the species, grade, and compliance with the applicable standard. Wood preservatives shall be pressure-applied and shall comply with ASTM D 1760. Creosote or arsenate treatments shall not be used.
- 2.2.1 Seatboard Lumber shall be kiln-dried Dense No. 1 Douglas fir or Dense No. 1 yellow pine boards.
- 2.2.2 Footboard Lumber shall be kiln-dried Dense No. 1 Douglas fir or Dense No. 1 yellow Southern pine boards.
- 2.2.3 Support Member and Timber shall be Dense No. 1 Douglas fir or Dense No. 1 yellow pine timbers or boards.
- 2.3 Ready-Mixed Concrete shall comply with ASTM C 94 with compressive strength of 3,000 pounds per square inch (210.9 kgs per square cm) at 28 days and shall be protected from freezing for seven days after placement.
- 2.4 Reinforcement for concrete shall comply with ASTM A 184, A 185, A 615 as indicated.
- 3.0 EXECUTION: Repair or replace wooden bleacher components using methods complying with the approved practices as referenced in American Institute of Timber Construction Timber Construction Manual.

END OF SECTION 11525



## SECTION 11526

### DEMOUNTABLE BLEACHERS (EXTERIOR)

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of demountable bleachers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
  - 2.1 Hardware and Accessories shall be zinc-coated or hot-dipped galvanized steel or aluminum.
  - 2.2 Lumber used for seatboard and footboard repair or replacement shall be species and grades complying with National Forest Products Association National Design Specification for Stress-Grade Lumber and Its Fastenings. Sizes shall comply with PS20. Lumber materials shall bear the mark of a recognized inspection agency identifying the species, grade, and compliance with the applicable standard. Wood preservatives shall be pressure-applied and shall comply with ASTM D 1760. Creosote or arsenate treatments shall not be used.
    - 2.2.1 Seatboard Lumber shall be kiln-dried Dense No. 1 Douglas fir or Dense No. 1 Southern pine boards.
    - 2.2.2 Footboard Lumber shall be kiln-dried Dense No. 1 Douglas fir or Dense No. 1 Southern pine boards.
  - 2.3 Steel Structural Members shall comply with ASTM A 36.
  - 2.4 Aluminum Structural Members shall comply with ASTM B 308.
- 3.0 EXECUTION: Repair or replace bleacher components using methods complying with the approved practices as referenced in American Institute of Timber Construction's Timber Construction Manual.

END OF SECTION 11526



## 11000 - Equipment

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### SECTION 11630a

#### CLOTHES DRYERS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of clothes dryers specified by the Contracting Officer. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work
- 2.0 PRODUCTS:
- 2.01 The machine shall be suitable for operation on a 120-208 volt, single phase, three wire circuit. Provide junction or outlet box on machine for 3/4" flexible conduit connection. Solid connection shall also be provided as required.
- 2.1 Cords and Plugs: UL 62 and UL 817.
- 2.2 Electrically Operated Valves: UL 429
- 2.3 Home Laundry Equipment: UL 560 and Fed. Spec. 00-W-860D.
- 2.4 Lamps and Lamp Holders: UL 496 and UL 542
- 2.5 General Electric: NFPA 70
- 3.0 EXECUTION: (Section not used)
- END OF SECTION 11630a





## SECTION 11630b

### CLOTHES WASHERS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of clothes washers, as specified by the Contracting Officer.. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
  - 2.01 The machine shall be suitable for operation on a 120 volt, single phase circuit. Provide six (6) feet of approved rubber covered flexible 3-wire cord (one for grounding frame of machine) and plug to match receptacle
  - 2.1 Cords and Plugs: UL 62 and UL 817.
  - 2.2 Electrically Operated Valves: UL 429
  - 2.3 Home Laundry Equipment: UL 560 and Fed. Spec. 00-W-860D.
  - 2.4 Lamps and Lamp Holders: UL 496 and UL 542
  - 2.5 General Electric: NFPA 70
- 3.0 EXECUTION: (Section not used)
  - 3.0.1 Provide special angle of elbow hose adapter and heavy flexible rubber hose for water connections so that machine may be set flush with enclosure panel. Provide heavy flexible hose with hooked and wasted water discharge.

END OF SECTION 11630b



## 11000 - Equipment

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### SECTION 11871

#### PLATFORM AND DOCK LEVELERS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for replacement, repair, and maintenance of platform and dock levelers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Replacement Components:
- 2.1.1 General: Replacement components shall be new and of matching quality and construction. Every replacement part shall be made to definite standards, tolerances, and clearances and to fit in the existing equipment.
- 2.1.2 Structural Components: All replacement parts of the equipment to be repaired shall be of such design, size material, and strength as required to carry and sustain the maximum allowable load placed upon it.
- 2.1.3 Hydraulic System Components: The hydraulic system shall consist essentially of a hydraulic pump, hydraulic rams, pressure relief valve, fluid reservoir, hydraulic control valves including necessary continuous-duty solenoid valves and check valves, and connections. The system shall be installed as a separate and complete system in each platform unit.
- 2.1.4 Electrical System Components: All electrical components shall comply with the National Electrical Code. Conduit, outlet boxes, and fittings shall be galvanized. Wire shall comply with Fed. Spec.J-C-30. All materials and equipment shall be rated for wet locations. Insulation resistance shall be not less than 1 megohm.
- 2.2 Permanent, Self-Forming, and Free Standing Adjustable Dock Levelers: Levelers shall comply with NBS Commercial Standard CS 202 for class A loading. Minimum live load capacity for rollover and crossover travel shall be 12,000 pounds. Physical dimensions and maximum capacity shall be as designated.
- 2.3 Permanent Manually Operated Dockboards: Permanent manually operated dockboards shall comply with NBS Commercial Standard CS 202 for class B loading. Minimum live load capacity for rollover and crossover travel shall be 12,000 pounds. Physical dimensions and maximum capacity shall be as designated.
- 3.0 EXECUTION:
- 3.1 Repair: Repair shall consist of removal and replacement of various defective equipment components. Installation of hydraulic system components shall be such that no leaks exist in any part of the system. All electrical work shall comply with the National Electrical Code.



## 11000 - Equipment

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- 3.2 Installation of Equipment: The equipment shall be installed by or under the supervision of, the manufacturer or his licensee. After installation is complete and equipment is properly adjusted, perform operational and load tests per manufacturer's instructions to ensure that the equipment functions properly and has the specified capacity.

END OF SECTION 11871



## 11000 - Equipment

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### SECTION 11873

#### PLATFORM AND DOCK LIFTS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for replacement, repair, and maintenance of platform and dock lifts. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work
- 2.0 PRODUCTS:
- 2.1 Replacement Components:
- 2.1.1 Structural Components: all replacement parts of the equipment to be repaired shall be of such design, size material, and strength as required to carry and sustain the maximum allowable load placed upon it.
- 2.1.2 Hydraulic System Components: Pipe, tubing, fittings, and hydraulic hose shall be designed and constructed with minimum safety factor of three based on bursting pressure. Cylinders, pumps, and control valves shall be designed to withstand test pressures of 150 percent of the design operating pressure.
- 2.1.3 Electrical System Components: All electrical components shall comply with the National Electrical Code. Conduit, outlet boxes, and fittings shall be galvanized. Wire shall comply with Fed. Spec. J-C-30. All materials and equipment shall be rated for wet locations. Insulation resistance shall not be less than one megohm.
- 2.2 Dock Lifts shall comply with NBS Commercial Standard CS 202. The replacement lift shall have the same capacity, travel, minimum lowered level, and nominal raising and lowering speed as the existing lift.
- 2.3 Truck Levelers: The truck leveler shall have a capacity of 40,000 pounds. Leveler Shall have a total travel of 36 inches, divided as follows: 18 inches up, 18 inches down.
- 3.0 EXECUTION:
- 3.1 Repair: Installation of hydraulic system components shall be such that no leaks exist in any part of the system. All electrical work shall comply with the National Electrical Code.
- 3.2 Installation of Equipment: The equipment shall be installed by, or under the supervision of the manufacturer or his licensee. After installation is complete and equipment is properly adjusted, perform operational and load tests per manufacturer's instructions to ensure that the equipment functions properly and had the specified capacity.

END OF SECTION 11873



## SECTION 11874

### PLATFORM AND DOCK ENCLOSURES

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for replacement, repair, and maintenance of platform and dock enclosures. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Fabric shall be hypalon-coated nylon, 5.1 oz. per sq. yd. with 65 percent coating on front and 35 percent on back face. Total weight with coatings shall be 16 oz. per sq. yd.
- 2.2 Thread shall be polyester heavy-duty minimum-size FF (Size 139) bonded, complying with Federal Specification V-T-285.
- 2.3 Wood Framing: Lumber shall be air-dried and well seasoned, to contain not more than 19 percent moisture at time of finishing, identified by official grade marks and shall be Douglas Fir-Larch No. 2 or better, Hemlock-Fir, no. 1 or better, or southern Pine No. 2 or better. Lumber shall be smooth on all sides.
- 2.4 Pads shall be polyurethane foam with a minimum density of 1.25 pounds per cubic foot and a 3650-pound compression factor, open cell construction on an ether vase. Foam shall be resilient from -50 F to +180 F. Pads shall be bonded to framing members..
- 2.5 Bottom Pads and Bumpers: Three polyurethane foam pads with cover fabric and two laminated or extruded rubber dock bumpers mounted to a continuous 2-inch by 12-inch wood frame.
- 3.0 EXECUTION: (Not Used.)
- END OF SECTION 11874



## 11000 - Equipment

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### SECTION 11875

#### PLATFORM AND DOCK BUMPERS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of platform and dock bumpers. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Timber Bumpers shall be dense red oak. Ends shall be smooth and edges rounded to a radius of approximately 1/2 inch. All bolt holes shall be countersunk. Bumpers shall be treated in compliance with Fed. Spec. TT-W-550. Treating process and results shall comply with Fed. Spec. TT-W-571. Retention shall be a minimum of 0.23 pounds of oxide per cubic foot of treated wood.
- 2.2 Laminated Rubber Bumpers shall be resilient rubber material made from rubberized fabric truck tires cut to uniform size pads and punched to receive 3/4-inch supporting rods. The bumpers shall be closed with 3-inch by 2-1/2 inch by 1/4-inch structural steel angles under approximately 15,000 pounds of pressure. Angles shall be welded to 3/4-inch rods at one end and closed with threaded rod and nuts at the other end. Anchor leg of angle shall extend a minimum of 2-1/2 inches beyond rubber surface at either end and contain 2 or 3 anchor bolt holes.
- 2.3 Extruded Rubber Bumpers shall be manufactured of extruded ethylene propylene diene monomers (EPDM) hydro-carbon rubber of 70 durometer hardness or higher and with a minimum tensile strength of 2,400 psi. All mounting holes shall be countersunk.
- 3.0 EXECUTION:
- 3.1 Removal of Existing Bumpers: Remove existing bumpers in a manner to prevent damage to the surface on which they are mounted. All existing anchor bolts that have deteriorated or are not in proper position to facilitate mounting of new bumpers shall be cut off flush with the base surface. Existing bumpers that have been mounted by welding shall be removed by cutting torch and resultant mounting surface power ground smooth and flush prior to installation of the new bumper.
- 3.2 Installation of New Bumper: All mounting hardware shall be new except existing expansion shields that are properly located and in suitable condition for reuse. Final installation shall be properly aligned, tight and flush against mounting surface.

END OF SECTION 11875



## SECTION 11876

### PLATFORM AND DOCK WARNING DEVICES

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of platform and dock warning devices. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal materials shall be as required to support the work.
- 2.0 PRODUCTS:
  - 2.1 Pavement Marking Paint shall comply with Fed. Spec. TT-P-115.
  - 2.2 Glass Spheres shall have at least 42 percent reflectivity and shall comply with the State Standard Specifications.
  - 2.3 Reflectors shall be acrylic plastic prismatic reflectors complying with State Standard Specifications.
- 3.0 EXECUTION:
  - 3.1 Preparation: Thoroughly clean all pavement areas to be painted by use of hand brooms, rotary broom, air blast, scrapers, or other acceptable means that will not damage the surface.
  - 3.2 Installation:
    - 3.2.1 Pavement Marking: Apply paint and glass spheres with mechanical equipment. Apply the paint and glass spheres uniformly to form markings of the dimensions and shapes required. Lines shall be true with sharp edges and ends. The length of the lines shall be within plus or minus 3 inches; width shall be within plus or minus 1/8 inch.
    - 3.2.2 Reflectors: Install reflectors at the locations and by the method required. Align and orient reflectors so that proper reflectivity is obtained.

END OF SECTION 11876



## 11000 - Equipment

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### SECTION 11877

#### PLATFORM AND DOCK GUARDRAILS AND POSTS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of platform and dock guardrails and posts. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
  - 2.1 Steel Guardrail: Steel plate beam guardrail, end sections, and splice plates shall comply with AASHTO M180. Steel posts, restraints, braces, and plates shall be galvanized.
  - 2.2 Materials for Timber Guardrail and Cable Guard Construction: Treated timber shall comply with the NFPA requirements for 1850F dense southern pine or 1900F dense Douglas fir. Wire rope cable and fastenings shall comply with AASHTO M30, Class A.
    - 2.2.1 Offset Spring Brackets shall have a deflection of one inch under a compression load of not less than 3,500 pounds and not more than 6,000 pounds applied for one minute perpendicular to the line of the cables with the cables in place. The offset spring brackets shall not collapse under a compression load of 10,000 pounds.
    - 2.2.2 Special Offset Spring Brackets of the blunt, slotted, overlapping nose type shall be fabricated from spring steel, tempered, and drawn. The brackets with steel stay pins shall be slotted for 3 cables. Special offset spring brackets shall have a minimum deflection of one inch under a compression load of 15,000 pounds applied for one minute perpendicular to the line of the cables at the points of attachment of the cables and the bracket with the cables in all slots.
- 3.0 EXECTUION:
  - 3.1 Guardrail Removal: Sections of guardrail shall be removed as required to provide access to damaged or deteriorated components.
  - 3.2 Guardrail Fabrications and Erection: New guardrail shall be erected in compliance with AASHTO M180 and the construction requirements for the type of guardrail being erected.
    - 3.2.1 Steel plate Beam Fabrication shall comply with AASHTO M180. roll or round the edges of the plates so that the present no sharp edges.
    - 3.2.2 Setting Timber and Steel Posts: Set posts in compacted soil to a minimum depth of 3 1/2 feet. Backfill the holes in minimum 6-inch layers with approved materials. Compact each backfill layer in a manner not to displace the posts from correct alignment.
    - 3.2.3 Painting: Steel surfaces that have not been galvanized shall be shop-coated with rust inhibitive primer paint. Give primed surfaces to be painted two coats of white or aluminum paint after erection. Where the surface will be inaccessible after erection, paint before installation.





## 11000 - Equipment

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- 3.2.4 Cable Guard: The offset brackets shall be attached to each post by means of one or more bolts not less than 3/4 inch in diameter inserted through the bracket and the post with the threaded end of the bolts at the back of the post. All bolts shall be sufficiently long to extend at least 1/4 inch beyond the nuts. After the posts and offset brackets have been set, the cables shall be erected and stretched taut by an approved mechanical device. The completed assembly shall provide a smooth, continuous platform and dock guard conforming to the required line and grade. After the cable has been stretched in its final position, the take up on adjustment bolts, intermediate anchors, and end anchors shall be made as necessary.

END OF SECTION 11877

END OF SPECIFICATION SECTION 11 - Equipment



## 11000 - Equipment

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## SECTION 12511

### ROLL-UP SHADES

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of roll-up shades. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.1 Manual Roll-Up Shading System: Manual shade mechanism and window shades shall conform to minimum requirements of Fed. Spec. DDD-S-251d as modified herein for standard shades and darkening shades and as it applies to 12 oz. Vinyl Coated Fiberglass base shade cloth.
- 1.2 SUBMITTALS
  - A. General: Submit the following in accordance with Conditions of Contract.
  - B. Product data for type of shade specified.
  - C. Shop drawings showing locations and size of shades, installation details, elevations indicating division between shade units, and location of shade pulls.
  - D. Samples for verification purposes in manufacturer's standard size, showing full range of color, texture, and pattern variations. Prepare samples from same material to be used for the work. Submit the following:
    - 1. 18-inch-square samples of each shade material.
    - 2. One operating unit for each type of shade.
  - E. Maintenance Data: Include data in Maintenance Manual.
- 1.4 PROJECT CONDITIONS
  - A. Field Measurements: Verify shade dimensions by field measurements. Verify shades can be installed in compliance with the original design.
- 2.0 - PRODUCTS
- 2.1 MANUFACTURERS
  - A. Manufacturers: Subject to compliance with requirements, provide products of one manufacturer equal to but not limited to the following:
    - 1. Automatic Devices Co.
    - 2. Architectural Window Treatments.
    - 3. Sundrape.
    - 4. BALI Commercial Window Treatments.
    - 5. Designer Shade by ULTEC.



## 12000 - Furnishings

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6. Kirsch Co.
7. Sun or Shade.
8. Draper.
9. Technical Blinds International, Inc.

### 2.2 SHADE MATERIAL, GENERAL

- A. Colors, and Textures: Manufacturer's standard material complying with the following requirements:
  1. Provide selections from manufacturer's full range of standard colors, and textures, for materials of type indicated.
  2. Density: Opaque (room darkening).
- B. Shade Pulls: Cord with breaking strength of not less than 30 lbs.
- C. Shade Cloth Fiberglass: Finish shade cloth shall be waterproof, washable and flame resistant in compliance with Fed, Spec. CCC-C521e. Flame resistant specification as it relates to test method 5903 of the Fed. test method standard 191-A.
  1. Shade cloth shall be opaque type fiberglass, total weight not less than 12 oz. per sq. yd. Minimum thread count to be not less than 60 threads per sq. in. A tensile strength minimum of this material per 1" strip shall be 130 lbs. in the warp direction and 200 lbs. in the fill direction. Maximum shift shall be 1/8 inch in either direction while rolling. Provide continuous width up 72 inches.
- D. Shade Roller: Manufacturer's standard construction of diameter, width, and material required to support shade without sag, equipped with cover plate to prevent accidental dislocation of tube.
  1. Material: Wood.
  2. Material: Metal.
  3. Material: Plastic.
  4. Direction of Shade Roll: Regular roll.
- E. Wood Rollers shall be used if shade length is not more than used below:
  1. 12' for up to 36" width cloth.
  2. 9' for up to 45" width cloth.
  3. 8' for up to 54" width cloth.
  4. 7' for up to 63" through 78", width cloth.

Note: Any length in excess of the above schedule shall be mounted on appropriate diameter all metal spring rollers-no wood components and no convolute components will be acceptable.
- F. Hem Bar: Continuous wood bar, located in shade hem pocket at lower edge of finished shade.
- G. Mounting Brackets: Manufacturer's standard to support the weight of the shade plus force required to operate shade.



2.3 FABRICATION

- A. Fabricate shade assemblies from non-corrosive materials that do not require lubrication during the normal expected life.
- B. Fabricate shade units to completely fill openings. Provide one shade for each section of window.
- C. Fabricate blind units so breaks between units occur only at mullions transoms or other defined vertical separations.
- D. Straight stitching with thread color to match shade color or clear nylon thread may be used.

3.0 EXECUTION

3.1 INSTALLATION

- A. Install shades level and plumb, in accordance with manufacturer's written instructions. Ensure unencumbered operation of window sash hardware.
- B. Make adjustments where necessary to provide sound and stable supports. Isolate metal parts of shade units from concrete or mortar to prevent galvanic action.

END OF SECTION 12511

END OF SPECIFICATION SECTION 12 - Furnishings



## 12000 - Furnishings

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## SECTION 13150

### ACCESS AND PEDESTAL FLOORS

#### 1.0 DESCRIPTION OF WORK

This specification covers the furnishing and installation of materials for the repair and maintenance of access and pedestal floors. Products shall match existing materials and/or as directed the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

#### 2.0 PRODUCTS

##### A. Floor panels:

1. Panels shall be constructed of a 1" thick high density particle board core, structurally bonded to electro-galvanized steel top and bottom sheets. The top and bottom sheets shall be permanently and structurally hemmed together to provide positive electrical continuity.
2. Panels shall have a maximum electrical resistance of 1ohm or less from the top edge of the panel, less surface covering and pedestal pad, to the understructure.
3. Concentrated Load: Panel shall support a 1,200 lb. load at any location, with a top surface deflection not to exceed .080", and a permanent set not to exceed .010"
4. Uniform Load: Panel shall support 250 lbs per square foot load, with a maximum top surface deflection not to exceed .040", and a permanent set not to exceed .010"
5. Ultimate Load: 2,600 lbs minimum at weakest point.
6. Rolling Load: Panels shall withstand a rolling load of 1,000 lbs. applied through a 3" dia. x 1 - 13/16" dia. wide phenolic caster for 10 passes. Permanent top surface set shall not exceed .040". Panels shall withstand a rolling load of 800 lbs. applied through a 6" diameter x 1-1/2" wide hard rubber-surfaced wheel for 10,000 cycles over the same path. Permanent top surface set shall not exceed .040".
7. Impact Load: A 100 lb. load dropped from 36" onto a one inch square indentor shall not cause system failure.
8. ASTM E-84: Flame spread of 5 or less and smoke development of 10 or less.

##### B. Air Supply Panels

Panels shall deliver a minimum 740 CFM at 0.1" water gauge of static pressure without damper; 540 CFM with damper.

##### C. Edging



## 13000 - Special Construction

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Trim edge of surfaced panels shall be mechanically retained onto the panel along its entire length. Trim edge shall be replaceable in the field and made of a vinyl that will not support combustion.

### D. Understructure

1. Pedestal assemblies are to be of electro-galvanized steel. The base shall be a minimum of 16 square inches and shall be stamped and/or embossed on its underside and shall be adhered to the sub-floor with an adhesive recommended by the flooring manufacturer.
2. Stringers: shall be roll formed 18 gauge electro-galvanized tee sections which double support the panel at the edge. Stringer shall nest between the panel flanges and be capable of supporting, at mid span, a 350 lb. concentrated load with less than .010" permanent set. Stringer pattern shall be either (2'x2', or 4'x4', or 2'x6') and shall be secured by a fastener or shall be 2'x2' snap-on and removable without tools.

END OF SECTION 13150





## SECTION 13600

### PRE-ENGINEERED STRUCTURES

#### 1.0 DESCRIPTION OF WORK

This specification covers the furnishing and installation of pre-engineered metal buildings. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be required to support the work.

#### 2.0 PRODUCTS

Metal building shall be the design and product of a recognized metal building manufacturer who is regularly engaged in the fabrication of pre-engineered structures.

##### 2.1 Design Requirements

2.1.1 Metal Buildings shall be designed for the dead load, designated live loads, and combinations of these loads as set forth in the MBMA publication, Recommended Design Practices Manual.

2.1.2 Framing and Structural Members: Structural steel members shall be designed in accordance with AISC publication, Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings. Structural cold-formed steel framing members shall be designed in accordance with the AISI publication, Specification for the Design of Cold-Formed Steel Structural Members. Framed openings shall be designed to structurally replace the covering and framing displaced. Welding of steel shall be in accordance with AWS D1.1

2.1.3 Exterior Covering: Maximum wind load deflection for wall sheets shall not exceed 1/180 of the span between supports: Maximum live load deflection for roof sheets shall not exceed 1/180 of the span between supports. Maximum deflections shall be based on sheets continuous across two or more supports with sheets unfastened and fully free to deflect.

##### 2.2 Materials

2.2.1 Hot-Rolled Structural Shapes: ASTM A 36 or A 529

2.2.2 Tubing or Pipe: ASTM A 500, Grade B; ASTM A 501; or ASTM A 53.

2.2.3 Members Fabricated from Plate or Bar Stock: 42,000 psi minimum yield strength; ASTM A 529, A 570, or A 572.

2.2.4 Members Fabricated by Cold Forming: ASTM A 607, Grade 50.

2.2.5 Galvanized Steel Sheet: ASTM A 446 with G 90 coating.

##### 2.3 Framing

2.3.1 Rigid Frames shall be hot-rolled structural steel; factory-welded and shop-painted built-up "I" shape or open web rigid frame consisting of tapered or parallel flange beams and tapered columns. Furnish



## 13000 - Special Construction

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complete with attachment plates, bearing plates, and splice members. Frames shall be factory-drilled for bolted field assembly.

- 2.3.2 End Wall columns shall be factory-welded, built-up "I" shape or cold-formed sections, fabricated of minimum 14-gauge material, and shop-painted.
- 2.3.3 Wind Bracing shall be adjustable, threaded steel rods, 1/2" in diameter minimum; ASTM A 36 or A 572, Grade D.
- 2.3.4 Secondary Framing: Purlins, eave struts, end wall beams, and flange and sag bracing shall be minimum 16- gauge rolled formed sections and shop-painted. Base channel, sill angle, end wall structural members (except columns and beams), and purlin spacers shall be minimum 14-gauge cold-formed steel, galvanized.
- 2.3.5 Bolts shall be ASTM A 307 or A 325 as necessary for design loads and connection details. Bolts shall be shop-painted, except zinc- or cadmium-plated units shall be provided when in direct contact with panels.
- 2.4 Roofing and Siding: Provide flashings, closers, fillers, metal expansion joints, ridge covers, fascias, and other metal accessories, factory-formed same material and finish as roofing and siding.
  - 2.4.1 Roof-Covering Assemblies shall have a wind uplift resistance rating of Class 90 in accordance with UL 580 and shall be listed in the UL Fire Resistance Index for wind uplift classification.
  - 2.4.2 Steel Covering shall be zinc-coated steel conforming to ASTM A 446, Grade C, with G 90 coating complying with ASTM A 525. Steel sheets and panels shall be not less than 26-gauge.
  - 2.4.3 Aluminized Steel Sheets shall be aluminum-coated, ASTM A 463, Drawing Quality with T1-40 coating. Metal thickness shall be not less than 26-gauge.
  - 2.4.4 Aluminum sheets shall be fabricated from aluminum alloy 3003 or 3004 Alclad with tempering as required to suit forming operations, ASTM B209. Aluminum sheet thickness shall be not less than 0.032 inch.
  - 2.4.5 Insulated Wall Panels shall be factory-assembled or field-assembled units, consisting of a central insulating core with metal interior and exterior face sheet securely fastened together with rivets, bolts, studs, "snap-on", or other approved methods of fastening, including interlocking with basic wall units.
- 2.5 Insulation:
  - 2.5.1 Insulation shall be batts, blankets, and/or rigid material of required thickness and density to provide an overall tested heat transfer U-value as required. Insulation shall have a flame spread classification of 25 or less and a smoke developed rating not in excess of 50 when tested in accordance with ASTM E 84. Exposed insulation shall be faced with a vapor barrier of vinyl film, vinyl reinforced foil, or foil reinforced kraft.
  - 2.5.2 Rigid or Semirigid Board Insulation, Form A, Class 1 or Class 2. Insulation shall have a white non-dusting and non-shedding painted finish.
  - 2.5.3 Blanket Insulation, Form B, Type I, Class 6. Insulation shall have a white sheet vinyl facing.
- 2.6 Accessories:



## 13000 - Special Construction

- 2.6.1 General: Provide coated steel accessories with coated steel roofing and siding; aluminum accessories with aluminum roofing and siding.
- 2.6.2 Gutters shall be formed in sections, complete with end pieces, outlet tubes, and special pieces that may be required. Finish to match roof fascia and rake.
- 2.6.3 Downspouts shall be formed in sections, complete with elbows and offsets, and shall be finished to match wall panels.
- 2.6.4 Circular Gravity Roof Ventilators shall be low-profile, ridge type ventilators, complete with base, bird screen, hood, flashing, closures, and fittings, finished to match roof panels.
- 2.6.5 Continuous Ridge Ventilators shall be factory-engineered and fabricated units of continuous heat valve type.
- 2.6.6 Wall Louvers: Provide units fabricated of not less than 18-gauge steel, finished to match wall panels. Provide bird screens of 1/2" x 1/2" galvanized steel mesh in rewirable frames on exterior face of louvers. Secure screens with clips to ensure ease of removal for cleaning and rewiring.
- 2.7 Hollow Metal Doors and Door Frames shall comply with Recommended Specifications for Standard Steel Doors and Frames (SDI-100), Steel Door Institute.
  - 2.7.1 Materials: Hot-rolled, pickled, and oiled in compliance with ASTM A 569 and A 568; cold-rolled in compliance with ASTM A 366 and A 568.
  - 2.7.2 Hollow Metal Units to receive mortised and concealed finish hardware, including cutouts, reinforcing, drilling, and tapping, shall comply with ANSI A 115, Specifications for Door and Frame Preparation for Hardware. Locate finish hardware in compliance with Recommended Locations for Builder's Hardware, NBHA.
  - 2.7.3 Hardware: Provide hardware for each door, as follows:
    - 2.7.3.1 Hinges: 1-1/2 pair, steel, template hinges, 4-1/2" x 4-1/2".
    - 2.7.3.2 Lockset: Cylindrical, key in knob
    - 2.7.3.3 Threshold: Extruded aluminum (exterior doors only).
    - 2.7.3.4 Weatherstripping: Sponge neoprene or extruded vinyl, enclosed in an aluminum housing. Bottom weatherstripping shall be an aluminum extrusion with vinyl sweep strip.
- 2.8 Overhead Doors
  - 2.8.1 Overhead Doors shall be industrial type of standard manufacture, fabricated of 24-gauge galvanized steel minimum or 0.032 inch thick aluminum. Accessories shall include galvanized steel track, torsion-spring mechanism, ball-bearing roller, cylinder lock, and weatherstripping. Doors shall be manually operated, except that doors over 144 square feet in area shall be chain hoist or electric motor operated.
    - 2.8.2.1 General: Provide operating door assemblies as a complete unit produced by one manufacturer, including door curtain, guides, counterbalance, hood, hardware, operators, and installation accessories.
    - 2.8.2.2 Door Curtain: Fabricate overhead coiling door curtain of interlocking slat designed to withstand required wind loading. Slats shall be structural quality, cold-rolled galvanized steel sheets complying



## 13000 - Special Construction

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with ASTM A 446, Grade, with G90 zinc coating, complying with ASTM A 525, and phosphate treated before fabrication, or aluminum slats, 5052 alloy, standard mill finish, not less than 0.04 inch thick.

- 2.9 Windows: Windows shall be of steel in accordance with the Steel Window Institute publication, Recommended Specifications for Steel Windows, or of aluminum in accordance with the AAMA publication AAMA 302.9. Windows shall be complete with operating and locking hardware and glazed.
- 2.10 Fabrication: Shop fabricate to the required size and section, complete with base plates, bearing plates, and other plates as required for erection, welded in place, and with all required holes for anchoring or connections shop drilled punched template dimensions. Shop connections shall be power riveted, bolted, or welded. Field connections shall be bolted.
- 2.11 Shop Painting:
  - 2.11.1 Clean surfaces to be primed of loose mill scale, rust, dirt, oil, grease, and other matter precluding paint bond. Follow procedures of SSPC-SP3 for power tool cleaning, SSPC-SP7 for brush-off blast cleaning, and SSPC-SP1 for solvent cleaning.
  - 2.11.2 Prime Structural Steel primary and secondary framing members with rust-inhibitive primer having over 50 percent rust-inhibitive pigment, such as red-lead mixed pigment alkyd varnish or zinc chromate iron-oxide alkyd.
  - 2.11.3 Prime Galvanized Members, after phosphoric acid pretreatment, with zinc dust-zinc oxide primer.
- 3.0 EXECUTION: Erection shall be in accordance with the approved erection instructions. Dissimilar materials that are not compatible when contacting each other shall be insulated from each other by means of gaskets or insulating compounds. Exposed surfaces shall be kept clean and free from sealant, metal cuttings, and other foreign materials.
- 3.1 Framing: Erect structural framing true to line, level, plumb, rigid and secure. Provide rake or gable purlins with tight-fitting closure channels and fascias. Provide diagonal rod or angle bracing in both roof and sidewalls as required. At framed openings provide shapes of proper design and size to reinforce opening and to carry loads and vibrations imposed, including equipment furnished under mechanical or electrical work.. Securely attach to building structural frame.
- 3.2 Roofing and Siding: Arrange and nest sidelap joints so that prevailing winds blow over, not into, lapped joints. Lap ribbed or fluted sheets one full rib corrugation. Apply panels and associated items for neat weathertight enclosure. Avoid "panel creep" or application or true to line. Protect factory finishes from damage. Provide weather seal under ridge cap; flash and seal roof panels at eave and rake with rubber, neoprene, or other closures to exclude weather.
- 3.2.1 Roof Sheets: Provide sealant tape at lapped joints of ribbed or fluted roof sheets and between roof sheeting and protruding equipment, vents, and accessories.
- 3.2.2 Wall Sheets: Apply elastomeric sealant continuous between metal base channel (sill angle) and concrete and elsewhere as necessary for waterproofing. Align bottoms of wall panels and fasten panels with blind rivets, bolts, or self-tapping screws.
- 3.3 Sheet Metal Accessories: Install gutters, downspouts, ventilators, louvers and other sheet metal accessories, for positive anchorage to building and weathertight mounting.
- 3.4 Swing Doors and Frames: Install doors and frames straight, plumb, and level.



## 13000 - Special Construction

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- 3.5 Overhead Doors: Set doors and operating equipment complete with necessary hardware, jamb and head mold stops, anchors, inserts, hangers, and equipment supports. Adjust moving hardware for proper operation.
- 3.6 Windows: Anchor windows securely in place. Seal entire perimeter of each unit with elastomeric sealant used for panels. Adjust and lubricate operating sash (vents) and hardware for proper operation. Clean surfaces of window units. Mount screens directly to frames with tapped screw clips.
- 3.7 Glazing: Clean channel surfaces and prime as recommended by sealant manufacturer. Cut glass to required size for measured opening; provide adequate edge clearance and glass bit all around. Install setting blocks at quarter points, set in a bed of sealant if heel-bead is used. Install spacers inside and out, all around, wherever liquid or plastic mastic compounds are used.
- 3.8 Thermal Insulation: Install blankets straight and true in one-piece lengths and both sets of tabs sealed to provide a complete vapor barrier.
- 3.9 Field Painting: Apply finish coating to factory-primed items.

END OF SECTION 13600



## 13000 - Special Construction

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### SECTION 13850

#### SWIMMING POOL ACCESSORIES

##### 1.0 DESCRIPTION OF WORK

This specification covers the furnishing and installation of swimming pool equipment. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

##### 2.0 PRODUCTS

2.1 Diving Stands shall be fabricated of 1-1/2" Schedule 40 stainless steel pipe. Their use shall be directed by facility dimensional requirements and shall comply with APHA, USS, NCAA, AAU, and FINA.

2.2 Diving Boards shall be fabricated of all aluminum or of laminated wood and fiberglass. All upper surfaces shall be non-skid, and all edges shall be rounded and sealed.

2.3 Ladders shall be fabricated from Type 304 stainless steel and have raised non-skid treads. Quantities, locations, and clearances shall comply with National Swimming Pool Institute Standards.

2.4 Lifeguard Chairs shall be fabricated from Type 304 stainless steel (framework and handrails) and have raised non-skid treads and non-skid platforms. Units shall comply with Safety Requirements, published by the National Swimming Pool Institute, and OSHA standards.

2.5 Underwater Lights of not less than 0.5 watts per square foot of pool area shall be provided in accordance with Lighting and Wiring, published by the National Swimming Pool Institute, and Article No. 68D of the National Electrical Code.

2.6 Pool Covers shall be polyethylene, having a flame spread rating of "0" as per ASTM E 84. Materials shall be non-toxic, non-absorbent, non-permeable, chemical-resistant and have an upper service limit of 110° F. Storage reels shall be constructed of Type 304 stainless steel.

2.7 Slides shall consist of fiberglass bodies with integral continuous flowing water supply, Type 304 stainless steel frames and raised non-skid ladder treads.

##### 3.0 EXECUTION (Section not used.)

END OF SECTION 13850

END OF SPECIFICATION SECTION 13 – Special Construction



## SECTION 14200

### ELEVATOR WELL

- 1.0 DESCRIPTION OF WORK: This specification covers the drilling well for elevator cylinder, and of furnishing and installing elevator cylinder well casing, grout ring, waterstop, and elevator pit floor, as indicated. Products shall match existing materials and /or shall be as directed by the Contracting Officer. Application procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS
  - 2.1 ELEVATOR CYLINDER WELL CASING ASSEMBLY
    - A. Casing: Continuous length of resin-impregnated, filament-wound fiberglass pipe having a constant inside diameter of 24 inches and a 1/2 inch thick wall.
    - B. Top-of-casing end-seal: 1/4 inch thick, resin-impregnated fiberglass sheet having a diameter of 25 inches.
    - C. Bottom-of-casing end seal: 5/8 inch thick resin-impregnated fiberglass dish sized to cap 24-inch inside diameter casing.
    - D. Joint fusing materials: Polyester resin blend and oxidizers, matched by casing manufacturer to fuse with casing and parts. Prepackaged in kits; supply fiberglass tape and accessories.
    - E. Acceptable manufacturer: CorBan Division Industrial Products Group Fiberboard Corp.'s, or accepted equivalent.
  - 2.2 CONCRETE: Class 3000
  - 2.3 ANNULUS FILL: Fine aggregate; ASTM C33.
  - 2.4 WATERSTOP: Resin-impregnated fiberglass.
- 3.0 EXECUTION
  - 3.1 PRELIMINARY WORK: Adjust grade at elevator pit to elevation of top of elevator pit slab before starting to drill.
  - 3.2 ELEVATOR CYLINDER WELL: Drill plumb. Remove foreign material, free water, and loose earth and rock from bottom of drilled well. Place concrete in well bottom in accordance with Section 03MA, CAST-IN- PLACE CONCRETE, and level top of concrete. Concrete shall have taken its initial set before casing is set.
  - 3.3 ELEVATOR CYLINDER WELL CASING ASSEMBLY
    - A. Fuse bottom seal on one end of casing watertight. Fuse in accordance with casing manufacturer's printed instructions. Permit joint to cure.
    - B. Place sealed end of casing in cylinder well and lower casing to rest on concrete.



## 14000 - Conveying Systems

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- C. Plumb casing, and restrain in plumb position. Fill annulus with damp annulus fill. Place fill in one-foot thick layers, and tamp each layer around casing before placing subsequent layer.
- D. Remove casing restraints, and protect installed casing from damage.
- E. Fuse top seal over casing opening watertight. Fuse in accordance with casing manufacturer's printed instructions; cure joint.
- F. Place pit floor against casing, and set waterstop.

END OF SECTION 14200





## SECTION 14204

### PASSENGER ELEVATORS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of hydraulic passenger elevators. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
- 2.1 Elevators shall be of size, type, and operation directed by the Contracting Officer. Elevators shall comply with the requirements of ANSI A17.1 and ANSI A17.1. Elevator cab shall be galvanized metal shell with enamel finish. Elevator doors shall be galvanized metal with enamel finish. Walls of elevator shall have raised plastic laminate panels. Structural and non-exposed ferrous metal surfaces shall receive two coats of structural grade primer. Elevator shall be complete with protective car pads and hooks.
- 2.2 Operating Equipment: Motors, pumps, controllers, hydraulic fluid reservoir, cylinder, casing, plunger, piping, guide rails, buffers, buttons, wiring, indicators, hardware, fittings, and all other equipment required to provide a fully operational elevator shall be provided.
- 2.3 Finishes:
- 2.3.1 Galvanizing: ASTM A 526, G90 Coating Designation.
- 2.3.2 Enamel: Shop-applied baked enamel of color as selected by the Contracting Officer.
- 2.3.3 Plastic Laminate: Fed. Spec. L-P-508H, color, texture, and pattern as selected by the Contracting Officer.
- 2.4 Wiring: All wiring necessary to connect operating buttons, switches, signals, and all electrical equipment on the car shall be provided. Wiring shall be in accordance with the National Electrical Code and shall, except for traveling cables, be installed in conduit, electrical metallic tubing, or metal wireways. Traveling cables shall be of the best grade for the service and shall be installed to provide a proper size loop for the car. Traveling cables shall have a fire-resistant outer braid bearing manufacturer's test information.
- 3.0 EXECUTION:
- 3.1 Preparation: Prior to installation of elevator, ensure that shafts and openings for moving equipment are plumb, level, and in line. Check measurements of space for equipment and means of access for installation and operation.
- 3.2 Installation: Install machinery, guides, controls, car, equipment, and accessories in accordance with applicable codes and standards. Installation shall provide a quiet, smoothly operating installation, free from sidesway, oscillation, or vibration.
- 3.3 Inspection: At completion of installation, elevator shall be inspected in accordance with ANSI A 17.2. All deficiencies shall be corrected and retested.



## 14000 - Conveying Systems

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### 4.0 SUBMITTALS:

- A. Shop drawings, wiring diagrams, manufacturer's data and test results must be approved by the Contracting Officer prior to installation.
- B. Furnish Contracting Officer all performance test results prior to final payment.

END OF SECTION 14204



## SECTION 14210

### FREIGHT ELEVATORS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of freight elevators. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
  - 2.1 Elevators shall comply with the requirements of ANSI A 17.1. When provisions for the handicapped are required, elevators shall comply with the requirements of ANSI A 117. 1. Elevator cab shall be galvanized metal shelf with enamel finish. Elevator doors shall be galvanized metal with enamel finish. Structural and non-exposed ferrous metal surfaces shall receive two coats of structural grade primer.
  - 2.2 Operating Equipment: Motors, pumps, controllers, hydraulic fluid reservoir, cylinder, casing, plunger, piping, guide rails, buffers, buttons, wiring, indicators, hardware, fittings, and all other equipment required to provide a fully operational elevator shall be provided.
  - 2.3 Finishes:
    - 2.3.1 Galvanizing: AS7M A 526, G90 Coating Designation.
    - 2.3.2 Enamel: Shop-applied baked enamel.
  - 2.4 Wiring: All wiring necessary to connect operating buttons, switches, signals, and all electrical equipment on the car shall be provided. Wiring shall be in accordance with the National Electrical Code and shall, except for traveling cables, be installed in conduit, electrical metallic tubing, or metal wireways, except that flexible conduit may be used for short runs. Traveling cables shall be of the best grade for the service and shall be so installed to provide a proper size loop for the car. Traveling cables shall have a fire-resistant outer braid.
- 3.0 EXECUTION:
  - 3.1 Preparation: Prior to installation of elevator, ensure that shafts and openings for moving equipment are plumb, level, and in line. Check measurements of space for equipment and means of access for installation and operation.
  - 3.2 Installation: Install machinery, guides, controls, car, equipment, and accessories in accordance with applicable codes and standards. Installation shall provide a quiet, smooth operation, free from sidesway, oscillation or vibration.
  - 3.3 Inspection: At completion of installation, elevator shall be inspected in accordance with ANSI A17.2. All deficiencies shall be corrected and retested.
- 4.0 SUBMITTALS:



## 14000 - Conveying Systems

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- A. Shop drawings, wiring diagrams, manufacturer's data and test results must be approved by the Contracting Officer prior to installation.
- B. Furnish Contracting Officer all performance test results prior to final payment.

END OF SECTION 14210



## SECTION 14300

### CRANES AND HOISTS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of cranes and hoists. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
- 2.1 Crane: Crane Manufacturers Association of America (CMAA) Specification No. 70, Specification for Electric Overhead Traveling Cranes, or Monorail Manufacturers Association (MMA) Specifications for Underhung Cranes and Monorail Systems.
- 2.2 Hoist: Hoist Manufacturers Institute HM 100, Specifications for Electric Wire Rope Hoists.
- 3.0 EXECUTION: The derrick shall be assembled and installed with the guy wires placed in position, hoisting ropes installed, and the derrick made ready for regular operation. Equipment installed outdoors shall be primed and finish-painted with a suitable corrosion-resistant paint on all parts and components not otherwise made of corrosion-resistant materials or otherwise protected.
- 4.0 SUBMITTALS:
- Shop drawings , coordination drawings and manufacturers data will be submitted prior to installation.
- END OF SECTION 14300



## 14000 - Conveying Systems

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### SECTION 14400

#### LIFTS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of commercial lifts. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS : Lifts shall comply with ANSI A17.1.
- 2.1 Lifts shall be electrically operated traction type with counterweights, winding drum type, or hand-operated chain or screw drive type for low-capacity, infrequent use as required. The lift shall be manufacturer's standard pre-engineered system.
- 2.2 Capacity Rating shall be 100 pounds, 50 pounds, or as required.
- 2.3 Speed shall be 50 fpm, with travel distance as required.
- 2.4 Hoistway Doors shall be 2 feet 6 inches wide by 3 feet 0 inches high, or as required.
- 2.5 Self-Supporting Structure: Provide units with structural steel self-supporting hoistway framing that requires vertical-load support only at base and lateral support only at landing levels to coordinate car movement with hoistway doors.
- 2.6 Machine Locations: Locate lift machines inside the shaft at top or bottom of hoistway as required.
- 2.7 Electric Control System: Provide standard, fully automatic call-and-send operation that responds to momentary push-button signals at each landing.
- 2.7.1 Pushbuttons Shall Be Inoperative while car is in transit, for a predetermined time period after car arrival at any given landing, or when any doors are open. Delivery calls shall take precedence over calls for service.
- 2.7.2 Provide Adjustable Limited Period of Time for receiving station to make its access to car, before responding to next station call-for- service. Post notice of limitation at each station.
- 2.7.3 When Delivery Has Been Completed, doors are closed, and no calls-for-service are registered, return car automatically for parking at indicated "home" station.
- 2.8 Materials and Finishes:
  - 2.8.1 Enameled Steel: Formed steel units with baked synthetic enamel finish.
  - 2.8.2 Primed-for-Paint Steel: Formed steel units with baked metal primer.
  - 2.8.3 Stainless Steel: AISI Type 302/304, with directional E polish or satin finish.
  - 2.8.4 Plastic Laminate: High-pressure type complying with NEMA LD3, 0.05 inch thickness.
- 2.9 Car Construction:



## 14000 - Conveying Systems

- 2.9.1 General: Provide car construction of either formed, reinforced, and sound-deadened sheet metal with welded joints; or of metal-clad plywood with mechanically riveted or bolted joints, with exposed edges of plywood covered with metal and with internal seams sealed by soldering. Provide shelves, compartments, gates and other features as required.
- 2.9.2 Car Light: Equip car with recessed incandescent light fixture, located in ceiling near front of car. Provide perforations or glazed port through car gate and hoistway doors near light location, sufficient for observation that car is present at landing.
- 2.10 Car Gates:
- 2.10.1 Manual Car Gates shall be of counterbalanced bi-parting vertical sheet steel with black enamel finish and electrical interlocks.
- 2.10.2 Power-Operated Car Gates shall be vertical bi-parting gates, equipped with power operator and connecting linkages to operate hoistway doors at landing when car is present.
- 2.11 Hoistway Doors: Provide flush hollow metal doors and frames of counterbalanced vertical bi-parting design.
- 2.12 Signal Equipment: Provide signal equipment at each landing hall push-button station; include call button, send button for each landing served, and illuminated "car-in-use" pilot light that flashes when car arrives at landing (until door is opened). Provide recessed station set in face of door jamb with surface-mounted stainless steel face plate.
- 2.13 Door Buttons: Where power operated doors are required, provide momentary pressure "door open" and constant pressure "door close" buttons.
- 2.14 Audible Arrival Signal: Provide standard bell or gong system on top of each car, equipped to sound as car approaches landing.
- 2.15 Audible Call Signal: Provide standard buzzer system on top of car, equipped to sound continuously when any call button is depressed and held, but only if car is located at a landing where hoistway door or car gate is open.
- 3.0 EXECUTION: (Section not used).
- 4.0 SUBMITTALS:
- Shop drawings, wiring diagrams, manufacturers data and test results must be submitted prior to installation.
- END OF SECTION 14400



## 14000 - Conveying Systems

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### SECTION 14401

#### PERSONNEL LIFTS

- 1.0 **DESCRIPTION OF WORK:** This specification covers the furnishing and installation of personnel lifts. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 **PRODUCTS:**
- 2.1 Personnel Lifts: Personnel lifts shall be electrically operated, electronically controlled platform type. Capacity shall be as directed. Lift shall have a capacity safety factor of 5. Lift speed shall not exceed 30 feet per minute. Platform shall be welded and bolted steel construction. Drive belts and/or chains shall have safeties that automatically lock the carriage to the guide rails in the event of slack or lift belt/chain failure. Lifts shall conform to ANSI A90.1. Lifts shall be complete with necessary screens and guards for moving parts and floor openings.
- 2.2 Controls: Personnel lifts shall be provided with normal and final limit switches at each stop. Lifts shall have emergency stop switch.
- 2.3 Motor: Motors shall be sized for capacity of lifts. Motor shall be direct drive, gear type with electric brake. Power requirements shall be as directed.
- 2.4 Wiring: All wiring necessary to connect operating buttons, switches, signals, and all electrical equipment on lifts shall be provided. Wiring shall be in accordance with the National Electrical Code and shall, except for traveling cables, be installed in conduit, electrical metallic tubing, or metal wireways, except that flexible conduit may be used for short runs. Traveling cables shall be of the best grade for the service and shall be so installed to provide a proper size loop for the car. Traveling cables shall have a fire-resistant outer braid.
- 3.0 **EXECUTION:**
- 3.1 Preparation: Prior to installation of lifts, ensure that shafts and openings for moving equipment are plumb, level, and in line. Check measurements of space for equipment and means of access for installation and operation.
- 3.2 Installation: Install machinery, guides, controls, lifts and equipment, and accessories in accordance with applicable codes and standards. Installation shall provide quiet, smooth operation free from sidesway, oscillation, or vibration.
- 3.3 Inspection: At completion of installation, lifts shall be inspected in accordance, with ANSI A17.2. All deficiencies shall be corrected and retested.
- 4.0 **SUBMITTALS:**
- Shop drawings, wiring diagrams, manufacturers data and test results must be submitted prior to installation.





## 14000 - Conveying Systems

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END OF SECTION 14401



## 14000 - Conveying Systems

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### SECTION 14402

#### CHAIR LIFTS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of chair lifts. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
- 2.1 Chair Lifts shall be of size, type, and configuration designated and shall be designed for the applicable stair configuration. Chairs applicable shall be padded, vinyl upholstered type. Chair lifts shall comply with the requirements of ANSI A90.1.
- 2.2 Operating Equipment: Motors, controllers, casings, guide rails, buffers, buttons, wiring, indicators, hardware, fittings, and all other equipment required to provide fully operational chair lift shall be provided.
- 2.3 Wiring: All wiring necessary to connect operating buttons, switches, signals, and all electrical equipment on chair lifts shall be provided. Wiring shall be in accordance with the National Electrical Code and shall, except for traveling cables, be installed in conduit, electrical metallic tubing, or metal wireways, except that flexible conduit may be used for short runs. Traveling cables shall be of the best grade for the service and shall be so installed as to provide a proper size loop for the chair lift. Traveling cables shall have a fire resistant outer braid.
- 3.0 EXECUTION:
- 3.1 Preparation: Prior to installation of chair lifts, ensure that installation surfaces are true to lines and levels. Check measurements of space for equipment and means of access for installation and operation.
- 3.2 Installation: Install machinery, guides, controls, chair lifts, equipment, and accessories in accordance with applicable codes and standards. Installation shall provide a quiet, smooth operation, free from sidesway, oscillation, or vibration.
- 3.3 Inspection: At completion of installation, chair lift shall be inspected in accordance with ANSI A17.2. All deficiencies shall be corrected and retested.
- 4.0 SUBMITTALS:
- Shop drawings, wiring, diagrams, manufacturers data and test results must be submitted prior to installation.

END OF SECTION 14402



## SECTION 14403

### VEHICULAR LIFTS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of vehicular lifts. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work,
- 2.0 PRODUCTS :
  - 2.1 Vehicular Lifts: Lifts shall comply with ANSI B153.1. Lifts shall have automatic mechanical lift lock. Lift lock shall be automatically activated when lift is operated to full stroke to prevent accidental lowering.
  - 2.2 Operating Equipment: Motors, controllers, casings, pumps, hydraulic fluid reservoir, cylinder, plunger, piping, buffers, wiring, indicators, hardware, fittings, and all other equipment required to provide a fully operational elevator shall be provided.
  - 2.3 Wiring: All wiring necessary to connect operating buttons, switches, signals, and all electrical equipment on the lift shall be provided. Wiring shall be in accordance with the National Electrical Code and shall be installed in conduit, electrical metallic tubing, or metal wireways, except that flexible conduit may be used for short runs.
- 3.0 EXECUTION:
  - 3.1 Preparation: Prior to installation of vehicular lifts, ensure that shafts and openings are plumb, level, and in line. Check measurements of space for equipment and clearances for operation.
  - 3.2 Installation: Install machinery, controls, and lift and its equipment and accessories in accordance with manufacturer's instructions and applicable codes and standards, to provide a quiet, smoothly operating installation, free from sidesway, oscillation, or vibration.
- 4.0 SUBMITTALS:

Shop drawings, wiring diagrams, manufacturers data and test results must be submitted prior to installation.

END OF SECTION 14403



## 14000 - Conveying Systems

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### SECTION 14404

#### ASH HOISTS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of ash hoists. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work..
- 2.0 PRODUCTS:
- 2.1 Winches and Sheaves:
- 2.1.1 Wire Rope Sheaves shall be iron or steel with bronze bushings, furnished either plain or as an assembly of frame, sheave, swivel hook, and axle as required.
- 2.1.2 Winches shall be of steel construction with bronze bearings on rotating parts. Winches shall have a capacity of not less than 500 pounds, with band action handbrake and drum width adequate for the quantity and diameter of wire rope to be used. Winches shall be marine type with gear cover and shall have corrosion-resistant parts and finish suitable for outdoor use.
- 2.1.2.1 Power Winches: NEAM 3 weather-protected, with two speeds (30 or 60 fpm) for lifting and a single speed for lowering. Push-button controls for hook travel.
- 2.1.2.2 Hand winch shall have spring-operated holding dogs, free-spooling feature, and adjustable handles.
- 2.1.3 Wire Rope: Wire rope shall be flexible, hoisting grade composed of approximately 7 strands or bundles of small diameter steel wire with a fiber or independent wire rope core.
- 2.2 Mast and Boom: Mast, boom, and miscellaneous fabricated components shall be provided as required to complete the unit assembly. Boom shall rotate. Fabricated parts shall be finished with a corrosion-resistant paint.
- 2.2.1 Mast shall telescope where required. Fully extended mast shall allow transport of ash container from bottom of pit to bed of truck without handling container twice.
- 2.2.2 Ash-Handling Pit shall have watertight door covering where required. Doors shall be mechanically linked to mast so that they automatically open and close with the raising and lowering of the mast.
- 3.0 EXECUTION: The Contractor shall complete the assembly of any equipment furnished partially assembled and place the items in position as directed. The ash hoist shall be assembled and securely bolted in position, hoisting ropes installed, and the hoist made ready for regular operation. The Contractor shall furnish all miscellaneous hardware items required to complete the installation of all equipment and components. Equipment shall be primed and finish painted with a suitable corrosion-resistant paint on all parts and components not made of corrosion-resistant materials or otherwise protected.

END OF SECTION 14404



## SECTION 14501

### AUTOMATIC CART TRANSPORTATION SYSTEMS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of automatic cart transportation systems. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
  - 2.1 Automatic Cart Transportation Systems: Automatic Cart Transportation Systems shall be of the size and configuration directed by the Contracting Officer. System shall be complete with manufacturer's standard steel rail system for the capacity required, chain drive, switches, carriers, carts, stops, and other accessories required for a complete installation. Field-painted components shall match adjacent surfaces.
  - 2.2 Operating Equipment: System shall be provided with manufacturer's standard automatic destination control circuitry. Control system shall allow fully automatic delivery of carts to predetermined locations. Motors, indicators, wiring, hardware, fittings, and all other equipment required to provide a fully operational cart transportation system shall be provided.
  - 2.3 Wiring: All wiring necessary to connect buttons, switches, signals, and all electrical equipment shall be provided. Wiring shall be in accordance with the National Electrical Code and shall be installed in conduit, electrical metallic tubing, or metal wireways, except that flexible conduit may be used for short runs.
- 3.0 EXECUTION:
  - 3.1 Preparation: Prior to installation, ensure that installation surfaces are true to lines and level. Check measurements of space for equipment, means of access for installation, and clearances for operation.
  - 3.2 Installation: Completed installation shall operate smoothly without undue noise, oscillation, or vibration.
- 4.0 SUBMITTALS:

Shop drawings, wiring, diagrams, manufacturers data and test results must be submitted prior to installation.

END OF SECTION 14501



## 14000 - Conveying Systems

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### SECTION 14564

#### TRASH CHUTES

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of trash chutes. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work. .
- 2.0 PRODUCTS:
- 2.1 General: Chutes shall be gravity type in accordance with the standards of NFPA 82. Intake doors shall bear the UL Class B, 1-1/2 hour, 250 F rating. Doors shall be tested in accordance with ASTM E 152 Fire Endurance Test.
- 2.2 Chutes: Chutes shall be manufactured of galvanized steel, aluminized steel, or stainless steel, as directed. Galvanized steel and aluminized steel shall be minimum 18 gauge. Stainless steel shall be minimum 0.05 inch thick. Diameter of chute shall be as directed. Chutes shall be provided with necessary supports. .
- 2.3 Intake Doors and Frames: Chutes shall be equipped with Type 302 stainless steel, hand hopper type intake doors bearing the UL Class B, 1-1/2 hour rating. Surfaces of doors and frames shall have satin finish. Doors shall be sized in accordance with the requirements of NFPA 82. Frame trim shall be minimum 0.060 inch thick, Type 302 stainless steel. Doors shall be self-closing and positive latching.
- 2.4 Outlet Doors: Outlet door shall be UL "B" label 1-1/2 hour fire rated, and equipped with a fusible link to be self closing and self latching.
- 2.5 Vent: Trash chute shall be provided with a roof vent in accordance with NFPA 82. Vent shall extend 4 feet minimum above roof line and be provided with flashing as required to provide a watertight installation. Vent shall be same diameter and material as trash chute. Vent shall be provided with a rain cap and bird screen.
- 2.6 Sprinklers: Sprinkler shall be provided as required by NFPA 82 and as directed. Sprinklers shall be installed in accordance with NFPA 13.
- 2.7 Hopper: Each trash chute shall be provided with a hopper type receptacle.
- 3.0 EXECUTION:
- 3.1 Preparation: Prior to installation of trash chute, ensure that shafts and openings are plumb, level, and in line. Check measurements of space for materials and means of access for installation.
- 3.2 Installation: Install trash chute in accordance with applicable codes and standards. Ensure that installation procedures maintain required fire resistance ratings.
- 4.0 SUBMITTALS:
- Provide Manufacturers Data for review.



## 14000 - Conveying Systems

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END OF SECTION 1456

END OF SPECIFICATION SECTION 14 – Conveying Systems



## 14000 - Conveying Systems

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## SECTION 15043

### TESTING AND BALANCING OF HVAC SYSTEMS

- 1.0 DESCRIPTION OF WORK: This specification covers testing and balancing of HVAC systems.
- 1.1 The equipment to be tested is air conditioning and ventilating systems.
- 2.0 PRODUCTS: (Section not used.)
- 3.0 EXECUTION:
  - 3.1 Test and Balance Contractor shall have in his/her employ a registered Mechanical Engineer who is engaged in testing.
  - 3.2 Certified Test Reports shall be submitted by the Contractor after approving same to the Contracting Officer. Test reports shall comply with the standards, listed below, of the selected test and balance association.
  - 3.3 The work shall comply with the recommendations of ASHRAE pertaining to instruments, measurements and procedures and with SMACNA's Manual for Balancing and Adjusting of Air Distribution Systems.
  - 3.4 Systems shall be tested at near maximum load conditions or as determined by the Contracting Officer. Cooling systems shall be tested in summer; heating systems shall be tested in winter. Proper allowance for duct leakage shall be made.
  - 3.5 Equipment Settings including dampers, valves, and similar equipment shall be marked to show final positions at the completion of balancing. the Contracting Officer will spot check to confirm the results prior to final payment. If checkout does not agree, then contractor shall furnish proof of the figures submitted and if requested, go back and re-test.
  - 3.6 Tests:
    - 3.6.1 General: The Contractor shall apply tests as specified below. Corpus Christi Army Depot shall receive results of the lab performance tests in triplicate. No work shall be covered or concealed before it is tested. Piping may be concealed after the hydrostatic test results are approved by the Contracting Officer.
    - 3.6.2 Hydrostaic Tests: Piping of steam, condensate return, fuel oil, and hot and/or chilled water systems shall be tested at not less than 80-pounds per square inch hydrostatic pressure, maintained for at least 4-hours during the progress of installation, and all leaks shall be properly and permanently eliminated. Caulking of leaky joints is not permitted. For testing purposes, end of piping to be tested shall be plugged or capped. Convectors, thermostatic vacuum traps, float-thermostatic traps, pneumatic valves and any other equipment or apparatus which may be damaged by this hydrostatic test shall be excluded from the test. See Section 15500 for testing of sprinkler system. High pressure steam piping (a system operating at a steam pressure of more than 15 psi) shall be hydrostatically tested at 150 percent of the design pressure, in accordance with the codes. Water piping shall be tested at 150 percent of design pressure.



## 15000 - Mechanical

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- 3.6.3 Steam Test: After the entire steam heating plant has been installed, and all convectors, etc. throughout have been connected, the entire plant, including risers, radiation, mains, indirect heaters, etc., shall be subjected to a period of not less than 3-hours, which test shall be made in the presence of the Contracting Officer or its authorized representative. Temporary steam gauges shall be installed at the boilers and at other designated points to provide for this test. After the test has been completed and found satisfactory, the temporary fixtures shall be removed.
- 3.6.4 Adjusting Test: After the cleaning-out operation has been completed and approved by the Contracting Officer, the Contractor shall test and operate the entire plant for not less than five (5) working days, (Corpus Christi Army Depot shall pay for fuel involved) and the Contractor shall assume all responsibility for the safety of the entire plant during such operation. Motors, pumps, fans, compressors, and other appliances shall be tested and adjusted during this period. This five-day test may be included in the instructional period (see para. 3.7 below).
- 3.6.5 Should the work be in such state that the above five-day run is not sufficient to test and make adjustments to all parts of the plant, then the Contractor shall continue to run the plant continuously for such a period as, in the opinion of the Contracting Officer, may be necessary to complete the adjustment of all parts, and until all parts have been adjusted.
- 3.6.6 Pump Tests: During the five-day test the vacuum pumps, if any, shall be tested as follows:
- A. With all valves open and with no steam on the system, the vacuum pump shall raise a vacuum of at least 20-inches of mercury measured at the gauge at the pump. With the pump not operating for one hour, the loss of vacuum shall not exceed 3-inches of mercury.
  - B. With the pumps operating alternately, and with steam on the entire system, the pumps shall each maintain a vacuum of 5 1/2-inches of mercury, as indicated by gauge on receiving tank at pumps. Steam pressure at boiler shall not exceed two pounds gauge pressure.
  - C. The above tests shall take place in the presence of the representative of the Contracting Officer. The Contractor shall give the Contracting Officer 48-hours notice in advance of this test.
- 3.6.7 Damper Tests: The dampers, deflectors, etc., shall be tested and adjusted during the above five-day test run, but this work must be carried out by parties other than the man delegated to supervise the operation of plant and instruct the Contracting Officer's staff. For details of damper adjustments, see Section 15866.
- 3.6.8 Defective Material: Any defective material or workmanship disclosed by the above-mentioned tests shall be removed and replaced with new, and the test repeated. The final certificate of payment will not be signed until all tests have been made and the work proved to be satisfactory to the Contracting Officer.
- 3.6.9 Labor, Etc., for Tests: Contractor shall furnish all labor, apparatus, etc., required for testing and operating. Fuel for tests will be furnished by the Contracting Officer
- 3.6.10 Time for Making Tests: All tests shall be made at times when the boilers are not being operated. The five-day test and the damper tests and adjustments shall be made starting during the period of "Instruction of Staff," discussed in Paragraph 3.7(C) below.
- 3.7 Instruction of Staff The Contractor shall furnish the services of competent personnel, whose duty shall be to instruct the Contracting Officer's Staff in the operation of the heating, ventilating and air



conditioning equipment. The instruction period shall total ten (10) days, which shall be apportioned as follows:

- A. The Staff shall be instructed in the operation of the heating and ventilating and air conditioning system on five (5) consecutive working days from 9 A.M. to 4 P.M.
- B. The Staff shall be instructed in the operation of the refrigeration equipment during the a (2) consecutive days period specified.
- C. The Staff shall be instructed in the operation of the temperature control system and any of the equipment installed under this contract during a three (3) day (not necessarily consecutive) period from 9 A.M. to 4 P.M. , as selected by the Contracting Officer's staff.

3.8 Manual of Operating Instructions: Contractor shall furnish the Contracting Officer's staff with three (3) copies of a Manual of Operating Instructions, which shall be type written (double spaced) on heavy bond paper and bound into a loose-leaf type book. The Manual shall contain complete starting and stopping instructions for each item of machinery and each heating, ventilating and air conditioning system installed as part of this contract. Actual location of starter or contractors of each item of machinery shall be indicated. A copy of the valve chart specified in Section 15100, Par. 3.9 shall also be included in this Manual. Contractor shall deliver the copies of the Manual to the Contracting Officer's staff prior to the 3-day instructional period specified in 3.7(C) above, and shall obtain a signed receipt for same.

END OF SECTION 15043



## SECTION 15060

### MECHANICAL PIPING

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of piping. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS: Piping shall comply with ANSI B31.1, B31.5, B31.8 Or B31.9, where applicable. Piping in pressure systems shall comply with requirements of the ASME Boiler and Pressure Vessel, Refrigeration Piping, Gas Transmission And Building services Piping Code, where applicable.
- 2.0.1 General:
- A. All pipe used shall be new, standard size, free from scale or rust. Each length of pipe shall be properly marked at the mill for proper identification with name or symbol of manufacturer. Dimensions for steel pipe shall be in accordance with the American National Standards Institute designation B36.20.
  - B. Nipples: All nipples shall be of same material as the pipe used in the lines, excepting the nipples with less than 1-inch unthreaded length, which shall be made of extra strong pipe.
  - C. Welding Fittings: Welded pipe lines shall have welding fittings. Branch connections from mains and headers shall have welding outlet fittings specially made to fit over the openings. Welding outlet fittings shall be "Weldolets" etc., manufactured by Bonney Forge and Tool Works, or other approved equal. Backing rings shall be inserted into the beveled pipe ends, the approved equal of Robvon Backing Ring Co.'s Type CCC. Welding ells shall have a mean radius approximately the outside diameter of the pipe. Welding fittings shall be of same material as the pipe or equivalent as approved and shall have wall thickness not less than the wall thickness of the pipe. The ends of pipe which are to be welded shall be machine chamfered. The ends of fittings which are to be welded shall be factory chamfered. The use of field chamfered fittings will not be accepted. Welding rods shall be high test rods of material similar to the pipe, or approved equal as approved.
  - D. Eccentric Fittings: To avoid trapping of condensation or air in mains at eccentric reducers use eccentric fittings. Install steam piping eccentric reducers with the offset to the bottom of the run, and install water piping eccentric reducers with the offset to the top of the run.
  - E. Reducing Fittings: Except for welded piping, no fittings shall be tapped for drip except in boss provided for that purpose. Reducing fittings shall be used where drips are required.
  - F. Right-and-Left Couplings: Final connections in piping shall be made with right-and-left couplings or fittings, except as specified in Par. (G). Right and left couplings for steel pipe shall be of malleable iron. Right hand couplings for steel pipe may be of steel.
  - G. Unions: In general, unions (flanged or screwed) shall be used in piping only adjacent to units of equipment such as pumps, oil burners, compressors, heating coils etc., or in other locations



where specified, where shown on the drawings, or where written permission is granted prior to installation. Unions shall not be used in mains. Where unions are used, they shall be 300 lbs.. Working Steam Pressure malleable iron with bronze-to-bronze, bronze-to-iron, or brass-to-iron ground joint, except as otherwise specified. The pressure rating shall be indicated on the union. Unions shall be the approved equal of E.M. Dart Co., S.G. Flagg Co. Unions in brass piping shall be 125 lbs. (minimum) W.S.P.. All brass or all bronze with ground joint, the approved equal of S.G. Flagg Co., Grinnell Co., or NY Brass Foundry.

- H. Flanges: Flanges shall be of the American Standard as adopted by the American Society of Mechanical Engineers. Welding flanges shall be socket type.
- I. Gaskets: Gaskets for steam service shall be at least 1/16" thick of the type consisting of a spirally wound stainless steel V-shaped strip with non-asbestos filler and an outer steel compression ring. They shall be suitable for high pressure steam service and shall be the equal of Garlock Mechanical Packing Division. Non-asbestos gaskets for water service use may be of sheet packing material.
- J. Pipe Bends: Pipe bends shown on drawings shall be made up from one length of pipe, threaded at ends for coupling or chamfered for welding. Pipe bends shall be made on radii not smaller than shown on drawings and all expansion pipe bends shall be properly anchored.
- K. Mechanical Coupling Type Fittings: The use of mechanical coupling type fittings on sprinkler piping in lieu of threaded pattern fittings is acceptable in sizes 2-inches to 8-inches inclusive. The mechanical couplings shall be self-centering and shall engage and lock the grooved pipe and/or fittings in a positive couple while allowing for some degree of angular pipe deflection, contraction and expansion. Each coupling shall consist of a malleable iron or ductile iron housing in two or more segments, a single molded composition sealing gasket, and two or more steel oval neck track bolts with hex nuts. Entire coupling installation including pipe grooving shall be performed in accordance with the manufacturer's instructions. Gustin-Bacon No. 105 Gruvagrip and Victaulic Style 75 couplings, together with their respective grooved end pipe fittings or approved equal having Corpus Christi Army Depot approval for this purpose, will be accepted.
- L. Flexible Hose: Furnish and install flexible hose connections in each water line at the circulating pumps and at the chillers in the locations shown on the drawings. Hose shall be made of stainless steel with close pitch annular corrugations, and shall have metallic braid covering. It shall be Allied Metal Hose Co. Style SSC-1, Flexonics Series 400L-Type 321, Metra-flex Co. Type SL, or approved equal. Submit shop drawings for approval.

### 2.1 Steel Pipe:

- 2.1.1 Pipe: Carbon steel pipe shall comply with ASTM A 53 or A 106. Galvanized pipe shall comply with ASTM A 120. Stainless steel pipe shall comply with ASTM A 312. Steel pipe shall be as manufactured by Bethlehem Steel Co., Jones & Laughlin Steel Corp., National Tube Co., Republic Steel Co., South Chester Tube Co., Wheeling Steel Corp., or Youngstown Sheet & Tube Co. Galvanized pipe, when specified or shown on drawings, shall be galvanized with Prime Western Spelter by the hot process and not wiped.
- 2.1.2 Fittings: Malleable iron threaded fittings shall comply with ANSI B16.3. Forged steel threaded and socket weld fittings shall comply with ASTM A 181 and shall be fabricated in compliance with ANSI



## 15000 - Mechanical

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B16.11. Forged stainless steel threaded and socket weld fittings shall comply with ASTM A 182 and shall be fabricated in compliance with ANSI B16.9. Stainless steel butt welded fittings shall comply with ASTM A 403 and shall be fabricated in compliance with ANSI B16.9.

2.1.3 Flanges: Carbon steel flanges shall comply with ASTM A 181 and shall be fabricated in compliance with ANSI B16.5. Stainless steel flanges shall comply with ASTM A 182 and shall be fabricated in compliance with ANSI B16.5. Use raised face, weld neck.

2.1.4 Bolting: Carbon steel bolting shall comply with ASTM A 307, Grade B, and shall be fabricated in compliance with ANSI B18.2.1 and B18.2.2. Stainless steel bolting shall comply with ASTM A 193, Grade B8, with hex nuts complying with ASTM A 194, Grade 8F, and shall be fabricated in compliance with ANSI B18.2.1 and B18.2.2.

### 2.2 Copper and Brass Pipe:

2.2.1 Pipe: Seamless copper pipe shall comply with ASTM B 42. Seamless red brass pipe shall comply with ASTM B 43. Copper pipe to be used with brazing or welding shall be oxygen free and shall comply with ASTM B 302 and B 88. Copper tubing shall be manufactured by Anaconda American Brass Co., Chase Brass and Copper Co. Phelps-Dodge Copper Products Corp., or Revere Copper and Brass Inc. All brass pipe shall be of the highest grade manufactured by Anaconda American Brass Co., Chase Brass and Copper Co., Phelps-Dodge Copper Products Corp., or Revere Copper and Brass, Inc. Refrigerant tubing shall be delivered to the site internally cleaned, packed with nitrogen or other inert gas, and capped.

2.2.2 Fittings: Threaded fittings shall comply with ASTM B 249 and shall be fabricated in compliance with ANSI B16.15. Solder fittings shall comply with ASTM B 88 and shall be fabricated in compliance with ANSI B16.18. Butt welding fittings shall comply with ASTM B 302 or B 88 and shall be fabricated in compliance with ANSI B16.9.

2.2.3 Flanges shall comply with ASTM B 61 and shall be fabricated in compliance with ANSI B16.31.

2.2.4 Bolting shall comply with ASTM B 36 and shall be fabricated in compliance with ANSI B18.2.1 and B18.2.2.

2.2.5 ACR Copper Tube: ACR (air conditioning and refrigeration) type copper tube is intended for use in field with special fittings for connections, repairs, and alterations in air conditioning and refrigeration installations.

### 2.3 Cast and Ductile Iron Pipe:

2.3.1 Pipe: Bell and spigot pipe shall comply with ASTM A 74 and shall be in compliance with ANSI A 112.5.1 and AWWA C106. Push-on type pipe shall comply with ASTM A 377 and shall be in compliance with ANSI A21.6, A21.8, and AWWA C106. Mechanical joint pipe shall comply with ASTM A 377, ANSI A 21.6, A21.8, A21.11, A21.51, and AWWA C106, C111, and C151. Flanged pipe shall comply with ASTM A 377, ANSI A21.6, A21.8, and B16.1, and AWWA C115. Threaded pipe shall comply with ASTM A 377 and shall be threaded at both ends for screwed fittings.

2.3.2 Fittings: Bell and spigot fittings shall comply with ASTM A 74, ANSI A112.5.1, and AWWA C110. Push-on type fittings shall comply with ASTM A 126 or A536, ANSI A21.10, and AWWA C110. Mechanical joint fittings shall comply with ASTM A 126 or A 536, ANSI A21.10 and A21.11, and AWWA C110 and C111. Flanged fittings shall comply with ASTM A 126 or A 536, ANSI A21.10 and B16.1, and AWWA C110. Threaded fittings shall comply with ASTM A 126 and ANSI B16.4.



- 2.3.3 Flanges shall comply with ASTM A 126 or A 536 and ANSI A21.15 and B16.1.
- 2.3.4 Gaskets: Gaskets for cast-iron soil pipe shall comply with ASTM C 564. Gaskets for mechanical joint or push-on type pipe shall comply with ANSI A21.11 and AWWA C111.
- 2.3.5 Bolting: Alloy steel bolting shall comply with ASTM A 193, Grade B8, and A 194, Grade 8F. Carbon steel bolting shall comply with ASTM A 307, Grade B, and shall be fabricated in compliance with ANSI B18.2.1 and B18.2.2.
- 2.4 ABS Pipe:
  - 2.4.1 Pipe: Waste and drain pipe shall comply with ASTM D 2661. Sewer pipe shall comply with ASTM D 2751. All other ABS pipe shall comply with ASTM D 1527.
  - 2.4.2 Fittings: Threaded fittings shall be Schedule 80 ABS and shall comply with ASTM D 2465. Socket solvent weld fittings for waste and drain pipe shall comply with ASTM D 2661. Socket solvent weld fittings for sewer pipe shall comply with ASTM D 2751. Socket solvent weld fittings for all other pipe shall be ABS Schedule 40 complying with ASTM D 2468 or ABS Schedule 80 complying with ASTM D 2469.
- 2.5 Vitrified Clay Pipe:
  - 2.5.1 Pipe: regular vitrified clay pipe shall comply with ASTM C 700. Perforated vitrified clay pipe shall comply with ASTM C 498.
  - 2.5.2 Fittings shall be regular vitrified clay complying with ASTM C 700.
  - 2.5.3 Compression Joint Sealing Element shall comply with ASTM C 425 and shall be of rubber, plastic, or metal.
- 2.6 Asbestos Cement Pipe, if existing, shall not be repaired but shall be replaced with new piping that does not contain asbestos, as directed by the Contracting Officer.
- 2.7 Polyethylene Pipe:
  - 2.7.1 Pipe: Polyethylene shall comply with ASTM D 2447. Pipe shall be polyethylene SDRPR and shall comply with ASTM D 3035. Pipe shall be flame retardant in accordance with ASTM test D-635.
  - 2.7.2 Fittings: Butt fusion type fittings shall comply with ASTM D 3261 Socket type fusion fittings shall comply with ASTM D 2683. Insert type heat fusion fittings shall comply with ASTM D 3197.
- 2.8 Acid-Resisting Glass Drainage and Vent Pipe, Etc.:
  - 2.8.1 Acid-resisting glass drainage and vent pipe and fittings shall be transparent, acid-resisting borosilicate glass. Glass shall be a product such as Glass No. 7740, designated as "Pyrex double tough drainline," as manufactured by Corning Glass Works or "Kimax" as manufactured by Owens-Illinois. Piping shall be "Regular Schedule."
  - 2.8.2 Fitting: Fitting for acid-resisting glass pipe. All fittings, the shape of which will permit, shall be tempered by heat treatment in order to increase their resistance to failure. The ends of all straight lengths (unless field cut) shall be tempered.
- 2.9 Conduit Systems:





## 15000 - Mechanical

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- 2.9.1 Carrier Pipe: Carbon steel pipe shall comply with ASTM A 106. Copper pipe shall comply with ASTM B 42. Fiberglass reinforced plastic pipe shall meet commercial standards.
- 2.9.2 Insulation: For systems 250 degrees or less, polyurethane foam insulation shall comply with commercial standards. For systems over 250 degrees, calcium silicate insulation shall comply with ASTM C 533.
- 2.9.3 Outer Jacket: For systems 250 degrees or less, polyvinyl chloride outer jacket shall comply with ASTM D 1785 or fiberglass reinforced plastic outer jacket shall meet commercial standards. For Systems over 250 degrees, cast-iron outer jacket shall comply with ASTM A 377, or steel conduit outer jacket shall be epoxy-coated, spiral weld, 10 gauge minimum.
- 2.10 Gaskets shall comply with ANSI B16.21 and/or the following:
  - 2.10.1 Gaskets shall be rubber complying with ASTM C 564.
  - 2.10.2 Gaskets for mechanical joint or push-on type cast-iron or ductile iron pie shall be rubber complying with ANSI A21.11 and AWWA C111.
- 2.11 Solvent Cement for solvent welding of pipe shall comply with ASTM D 2564, except solvent cement for ABS pipe and fittings shall comply with ASTM D 2235.
- 3.0 EXECUTION:
  - 3.1 Flame Cutting: No cutting by torch shall be done without authorization from the Contracting Officer.
  - 3.2 Restoration: All disturbed pavement , sodding, soil, and other objects shall be restored to match original condition. Pavement shall be restored with material to maintain the same load bearing capacity as the original or as instructed by the Contracting Officer.
  - 3.3 Welding: All welding shall be performed in compliance with ANSI B31.1 and/or ASME Boiler and Pressure Vessel Code Section IX, as applicable.
  - 3.4 Solvent Cement Joints shall be made in compliance with ASTM D 2855.
  - 3.5 Heat Fusion Joints in polyethylene pipe and fittings shall be made in compliance with ASTM D 2657.
  - 3.6 Concrete Linings: All pipe shall be cement lined in accordance with ANSI Standard A 21.4. However, thickness of lining shall be 1/8" minimum. A plus tolerance of 1/8" shall be permitted on all sizes of pipe.
  - 3.7 Protective Covering for Replacement Underground Steel Pipe shall be mechanically applied in a factory or field plant especially equipped for the purpose. Specials valves, and fittings that cannot be coated and wrapped mechanically shall have the protective covering applied by hand. Joints shall be coated and wrapped by hand. The pipe covering shall consist of a coat of coal-tar primer, a coat of coal-tar enamel, a paper or a coat or water-resistant whitewash, applied in the order named and complying with the requirements of AWWA C203 in all respects to materials, thickness, methods, of application, tests, and handling, except that interior lining will not be required. Joints and fittings shall be coated and wrapped in compliance with AWWA C203.
  - 3.8 Hydrostatically Test Pipe Systems where required by ANSI B31.1 or ASME Code.
  - 3.8.1 Cleaning, Flushing, Inspecting:





Clean exterior surfaces of installed piping system of superfluous materials, and prepare for application of specified coatings (if any). Flush out piping systems with clean water before proceeding with required tests. Inspect each run of each system for completion of joints, supports and accessory items.

Inspect pressure piping in accordance with procedures of ASME B31.

### 3.8.2 Piping Tests:

Provide temporary equipment for testing, including pump and gages. Test piping system before insulation is installed wherever feasible, and remove control devices before testing. Test each natural section of each piping system independently but do not use piping system valves to isolate sections where test pressure exceeds valve pressure rating. Fill each section with water and pressurize for indicated pressure and time.

Required test period is 2 hours.

Test runs of Schedule pipe at the design pressure of the system.

Observe each test section for leakage at end of test period. Test fails if leakage is observed or if pressure drop exceeds 5% of test pressure depending upon the ambient temperature encountered. Repair piping system sections which fail required piping test, by disassembly and re-installation or as directed by the Contracting Officer, using new materials to extent required to overcome leakage. Do not use chemicals, stop-leak compounds, mastics, or other temporary repair methods.

Drain test water from piping systems after testing and repair work has been completed.

END OF SECTION 15060



## SECTION 15100

### VALVES

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of valves. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

1.1 Quality Assurance:

A. Manufacturers: Firms engaged in the manufacturing of valves, of types and sizes required, whose products have been in satisfactory use in similar service with the Contracting Officer.

B. Codes and Standards

MSS Compliance: Mark valves in accordance with MSS-25" Standard Marking System for valves, fittings, flanges and unions".

ANSI Compliance: for face-to-face and end-to-end dimensions.

UL and FM Compliance: Provide valves used in fire protection piping which are UL-listed and FM approved.

1.2 Submittals:

A. Product Data: Submit manufacturer's technical product data, including installation instructions for each type of valve. Include pressure drop curve or chart for each type and size of valve. Submit valve schedule showing Manufacturer's figure number, size, location, and valve features for each required valve.

B. Shop Drawings: Submit manufacturer's assembly-type (exploded view) shop drawings for each type of valve, indicating dimensions, weights, materials, and methods of assembly of components.

C. Maintenance Data: Submit maintenance data and spare parts lists for each type of valve. Include this data, product data, and shop drawings in Maintenance Manual; in accordance with requirements of "A" above.

2.0 PRODUCTS:

2.1 Material & Manufacturers:

A. General:

1. Provide factory-fabricated valves recommended by manufacturer for use in service indicated. Provide valves of types and pressure ratings indicated; provide proper selection as determined by Installer to comply with installation requirements. Provide end connections which properly mate with pipe, tube, and equipment connections. Where more than one type is indicated, selection is Installer's option.



2. Sizes: Unless otherwise indicated, provide valves of same size as upstream pipe size.
  3. Operators provide handwheels, fastened to valve stem, for valves other than quarter-turn. Provide lever handle for quarter-turn valves, 6" and smaller. Provide gear operators for quarter-turn valves 8" and larger. Provide chain-operated sheaves and chains for overhead valves as indicated in drawing.
- B. Gate Valves:
1. Comply with the following standards:  
Cast-Iron Valves: MSS SP-70.  
Bronze Valves: MSS SP-80.  
Steel Valves: ANSI B16.34.
  2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering gate valves which may be incorporated in the work include, but are not limited to, the following:  
See Schedule 3.3-1
- C. Globe Valves:
1. Comply with the following standards:  
Cast-Iron Valves: MSS SP-85.  
Bronze Valves: MSS SP-80.  
Steel Valves: ANSI B16.34.
  2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering globe valves which may be incorporated in the work include, but are not limited to, the following:  
See Schedule 3.3-2
- D. Drain Valves
- Available Manufacturers: Subject to compliance with requirements, manufacturers offering drain valves which may be incorporated in the work include, but are not limited to, the following:  
See Schedule 3.3-3
- E. Butterfly Valves:
1. General: Comply with MSS SP-67 and AWWA 304. Where butterfly valves are used as shutoffs for terminal or equipment removal or repair, select lug-body type valves. Select wafer type valves for other applications. Provide gear operators (as directed by the Contracting Officer) on butterfly valves 8" and larger.
  2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering butterfly valves which may be incorporated in the work include, but are not limited to, the following:  
See Schedule 3.3-6



## 15000 - Mechanical

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### F. Swing Check Valves:

#### 1. Comply with the following standards:

Cast-Iron Valves: MSS SP-71

Bronze Valves: MSS SP-80

Steel Valves: ANSI B16.34

#### 2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering swing check valves which may be incorporated in the work include, but are not limited to, the following:

See Schedule 3.3-7

### G. Wafer Check Valves:

#### 1. General: Provide wafer style, butterfly type, spring actuated check valves designed to be installed with gaskets between 2 standard Class 125 flanges.

#### 2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering wafer check valves which may be incorporated in the work include, but are not limited to, the following:

See Schedule 3.3-8

### I. Plug Valves

Available Manufacturers: Subject to compliance with requirements, manufacturers offering plug valves which may be incorporated in the work include, but are not limited to, the following:

See Schedule 3.3-4

### J. Valve Features:

General: Provide valves with features indicated and, where not otherwise indicated, provide proper valve features as determined for installation requirements.

Comply with ASME B31.1 for power piping.

Bypass: Comply with MSS SP-45, and except as otherwise indicated, provide manufacturer's standard bypass piping and valving.

Drain: Comply with MSS SP-45, and provide threaded pipe plugs.

Flanged: Valve flanges complying with ANSI B16.1 (cast iron), ANSI B16.5, (steel), or ANSI B16.24 (bronze).

Threaded: Valve ends complying with ANSI B2.1.

Butt-Welding: Valve ends complying with ANSI B16.25.

Socket-Welding: Valve ends complying with ANSI B16.11.

Solder-Joint: Valve ends complying with ANSI B16.18.

Flangeless: Valve bodies manufactured to fit between flanges complying with ANSI B16.1 (cast iron), ANSI B16.5 (steel), or ANSI B16.24 (Bronze).



3.0 EXECUTION:

3.1. Installation:

1. General: Except as otherwise indicated, comply with the following requirements:

Install valves where required for proper operation of piping and equipment, including valves in branch lines where necessary to isolate sections of piping. Locate valves so as to be accessible and so that separate support can be provided when necessary.

Install valves with stems pointed up, in vertical position where possible, but in no case with stems pointed downward from horizontal plane unless unavoidable. Install valve drains with hose-end adapter for each valve that must be installed with stem below horizontal plane.

2. Insulation: Where insulation is indicated, install extended-stem valves, arranged in proper manner to receive insulation.
3. Mechanical Actuators: Install mechanical actuators with chain operators where indicated. Extend chains to about 5'-6" on the floor and hook to clips to clear aisle passage.
4. a. Selection of Valve Ends (Pipe Connections): Except as otherwise indicated, select and install valves with the following ends or types of pipe/tube connections:

Tube Size 2" and Smaller: Soldered-joint valves.

Pipe Size 2" and Smaller: One of the following:

Threaded valves.

Grooved-end valves.

Butt-welding valves.

Socket-welding valves.

Flanged valves.

Flangeless valves.

Single flanged valves.

Pipe Size 2 1/2" and Larger: One of the following:

Grooved-end valves.

Butt-welding valves.

Socket-welding valves.

Flanged valves.

Wafer valves.

Single flanged valves.

Hub-and-spigot valves.

Mechanical joint end valves.



## 15000 - Mechanical

- b. Valve System: Select and install valves with outside screw and yoke stems, except provide inside screw non-rising stem valves where headroom prevents full opening of OS&Y valves.
- c. Non-Metallic Disc: Limit selection and installation of valves with non-metallic discs to locations indicated and where foreign material in piping system can be expected to prevent tight shutoff of metal seated valves.
- d. Renewable Seats: Select and install valves with renewable seats, except where otherwise indicated.
- e. Fluid Control: Except as otherwise indicated, install gate, ball, globe, and butterfly valves to comply with ANSI B31.9. Where throttling is indicated or recognized as principal reason for valve, install globe or butterfly valves.

### 5. Installation of Check Valves:

- a. Swing Check Valves: Install in horizontal position with hinge pin horizontally perpendicular to center line of pipe. Install for proper direction of flow.
- b. Wafer Check Valves: Install between 2 flanges in horizontal or vertical position, position for proper direction of flow.
- c. Lift Check Valve: Install in piping line with stem vertically upward, position for proper direction of flow.

### 3.2. Adjusting and Cleaning:

- 1. Valve Adjustment: After piping systems have been tested and put into service, but before final testing, adjusting, and balancing, inspect each valve for possible leaks. Adjust or replace packing to stop leaks, replace valve if leak persists.
- 2. Valve Identification: Tag each valve in accordance with "Mechanical Identification".

Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

### 3.3. Schedule:

General: Provide the following valves for various valve types listed in Division-15 piping sections.

#### 1. Gate Valves:

- a. 2" and Smaller: Class 125, bronze, screw-in bonnet, rising stem, solid wedge.

	Threaded	Solder
	Ends	Ends
Crane:	428	1334
Fairbanks:	0252	0282
Grinnell:	3010	3010-SJ
Hammond:	IB640	IB635
Jenkins:	47	1242



Lunkenheimer:	2127	2132
Milwaukee:	148	1149
Nibco:	T-111	S-111
Powell:	500-S	1821-S
Stockham:	B-100	B-108
Walworth:	55	55-SJ

- b. 2" and Smaller: Class 125, bronze, screw-in bonnet, non-rising stem, solid wedge.

	Threaded	Solder
	<u>Ends</u>	<u>Ends</u>
Crane:	438	1324
Fairbanks:	0250	0280
Grinnell:	3000	3000-SJ
Hammond:	IB645	IB647
Jenkins:	370	1240
Lunkenheimer:	2129	2133
Milwaukee:	105	1145
Nibco:	T-113	S-113
Powell:	507	1822
Stockman:	B-103	B-104
Walworth:	55	4-SJ

- c. 2 1/2" and Larger: Flanged ends, class 125, iron body, bolted bonnet, solid wedge, bronze mounted.

	Non-Rising	
	<u>OS&amp;Y</u>	<u>Stem</u>
Crane:	465 1/2	61
Fairbanks:	0405	0403
Grinnell:	6020	6060
Hammond:	IR1140	IR1138
Jenkins:	651A	326
Lunkenheimer	1430	1428
Milwaukee:	F-2885	F-2882
Nibco:	617-0	F-619
Powell:	1793	1787



## 15000 - Mechanical

- Stockman: G-623 G-612  
Walworth: 8726-F 8719-F
- d. Hose End; 2 1/2": FM, 175 psi, bronze body, solid wedge, inside screw, non-rising stem.  
Provide cap and chain.  
Fairbanks: 0210.  
Jenkins: 707.  
Lunkenheimer: 366.  
Nibco: T-103-HC.  
Walworth: 115.
- e. Threaded End; 2" and Smaller: FM, UL-listed, 175 psi, bronze body, solid wedge, outside screw and yoke, rising stem.  
Crane: 459.  
Fairbank: 0412.  
Hammond: IR1154.  
Jenkins: 825-A.  
Nibco: F-607-O.  
Stockham: G-634.  
Walworth: 8713-F.
- f. Flanged End; 2 1/2" and Larger: FM, UL-listed, 175 psi, iron body bronze mounted, solid wedge, outside screw and yoke, rising stem.  
Crane: 467.  
Fairbanks: 0412.  
Hammond: IR1154.  
Jenkins: 825-A.  
Nibco: F-607-O.  
Stockham: G-634.  
Walworth: 8713-F.
2. Globe Valves:
- a. 2" and Smaller: Class 125, bronze body, screw-in bonnet, integral seat renewable disc.
- |            | Threaded<br>Ends | Solder<br>Ends |
|------------|------------------|----------------|
| Crane: 1   | 1310             |                |
| Fairbanks: | 045              | 0583           |





## 15000 - Mechanical

Grinnell:	3200	3210-SJ
Hammond:	IB440	424
Jenkins:	746	1200
Lunkenheimer:2140	126	
Milwaukee:	502	1590
Nibco:	T-211-B	S-211
Powell:	650	1823
Stockham:	B-16	B-14-T
Walworth:	3058	95-SJ

- b. 2" and Smaller: Class 125, bronze angle body, screw-in bonnet, integral seat, renewable disc.

	Threaded	Solder
	<u>Ends</u>	<u>Ends</u>
Crane:	2	1311
Fairbanks:	046	0583
Grinnell:	3220	-
Hammond:	IB463	-
Jenkins:	-	1202
Lunkenheimer:	2141	126
Milwaukee:	504	1590
Nibco:	T-311	S-311
Powell:	651	1824
Stockham:	B-216	B-214
Walworth:	59	95-SJ

- c. Flanged Ends; 2 1/2" and Larger: Class 125, iron body, bolted bonnet, renewable seat and disc, bronze mounted.

	Straight	Angle
	<u>Body</u>	<u>Body</u>
Crane:	351	353
Fairbanks:	0131	0133
Hammond:	IR116	IR118
Jenkins:	613	-
Lunkenheimer:	1123	1124



## 15000 - Mechanical

Milwaukee:	F2981	F2986
Nibco:	F-718-B	F-818-B
Powell:	241	243
Stockham:	G-512	G-515
Walworth:	8906-F	8907-F

### 3. Drain Valves:

Class 125: bronze body, screw-in bonnet, rising stem, composition disc, 3/4" hose outlet.

	Threaded Ends	Solder Ends
Hammond:	712	711
Lee:	717-20	717-12
Mansfield:	526.40	526.41
Nibco:	73	72
Prier:	C-73ST	C-71ST
Tanner:	806	851

### 4. Plug Valves:

- a. 2" and Smaller: 150 psi, bronze body, straightway pattern, square head, threaded ends.

Lunkenheimer: 454

- b. 2 1/2" and Larger: 175 psi, lubricated plug type, semi-steel body, single gland, wrench operated, flanged ends.

Nordstrom: 143.

Powell: 2201.

Walworth: 1718F.

NOTE: Cocks, where specified or shown on the drawings in other line, shall be plug valves.

### 5. Ball Valve:

- a. 1" and Smaller: 150 psi, bronze body, standard port, bronze trim, 2-piece construction, TFE seats and seals.

	Threaded Ends	Solder Ends
Conbraco:	70	70
Crane:	2182	2182
Grinnell:	3700	3700-SJ



Jamesbury:	21-1100	-
Jenkins:	900T	902T
Metraflex:	IT	IS
Nibco:	T-585	S-585
Powell:	4520R20	4210R
Stockham:	S-216BRRT	S-216BRRS
Watts:	B-6000	B-6001

- b. 1 1/4" to 2": 150 psi, bronze body, standard port, 3-piece body, TFE seats with bronze trim.

	Threaded Ends	Solder Ends
Conbraco:	82	82
Fairbanks:	0851	-
Nibco:	T-595-Y	S-959-Y
Powell:	4201-R	4201-R
Watts:	B-6800	B-6801

6. Butterfly Valve:

- a. 6" and Smaller: 150 psi, cast-iron body, extended neck, aluminum bronze disc, reinforced resilient EDPM seat, manual lever and lock.

	Wafer	Lug
Center Line:	Series A	Series LT
Crane:	12	14
Demco:	Series CE	Series CE
Fairbanks:	302	502
Grinnell:	WC-8211	LC-8211
Hammond:	3804	3824
Jamesbury:	815W	815L
Keystone:	100	122
Nibco:	WL-082-3	NL-082-3
Powell:	Series 1000	Series 5000
Stockham:	LG-511-BS3E	LD-711-BS3E

Grooved Ends: Victaulic Series 700.



## 15000 - Mechanical

- b. 8" and Larger: 150 psi, cast iron body, extended neck, aluminum bronze disc, reinforced resilient EDPM seat, gear operator.

	<u>Wafer</u>	<u>Lug</u>
Center Line:	Series A	Series LT
Crane:	12	14
Demco:	Series CE	Series CE
Fairbanks:	402	602
Grinnell:	WC-8212	LC-8212
Keystone:	100	122
Nibco:	WL-082-5	NL-082-5
Powell:	Series 1000	Series 5000
Stockham:	LG-521-BS3E	LD-721-BS3E
Grooved Ends: Victaulic Series 701.		

7. Check Valves:

- a. 2" and Smaller: Class 125, bronze body, horizontal swing, regrinding type, Y-pattern, renewable disc.

	<u>Threaded Ends</u>	<u>Solder Ends</u>
Crane:	37	1342
Fairbanks:	0640	0680
Grinnell:	3300	3300-SJ
Hammond:	IB940	IB941
Jenkins:	92-A	1222
Lunkenheimer:	2144	2145
Milwaukee:	509	1509
Nibco:	T-413	S-413
Powell:	578	1825
Stockham:	B-319	B-309
Walworth:	3406	3406-SJ

- b. 2 1/2" and Larger: Class 125, iron body, bolted bonnet, horizontal swing, renewable seat and disc, flanged ends.

Crane: 373.

Fairbanks: 0702.



Grinnell: 6300.

Hammond: IR1124.

Jenkins: 624.

Lunkenheimer: 1790.

Milwaukee: F2971.

Nibco: F-918.

Powell: 559.

Stockhan: G-931.

Walworth: 8928-F.

- c. 2 1/2" and Larger; FM: 175 psi, iron body bronze mounted, renewable composition disc and bronze seat ring, bolted cover, flanged ends.

Fairbanks: 0711.

Jenkins: 729.

Nibco: F-908-W.

Stockham: G-940.

Walworth: 8883-LT.

8. Wafer Check Valves:

- a. All Sizes: 125 psi, cast-iron body, aluminum bronze or plated iron plates, stainless steel stem, Buna-N seat, stainless steel springs.

Bell & Gossett: NS.

Center Line: CLC.

Metraflex: Chexx.

Mission: 12HMP.

Stockham: WG970.

Grooved Ends: Victaulic Series 711.

9. Lift Check Valves:

2" and Smaller: 125 psi, bronze body, lift type, spring loaded, renewable disc, threaded ends.

	<u>Horizontal</u>	<u>Angle</u>
Fairbanks:	0626	0618
Hammond:	-	IB-954
Jenkins:	655-A	188-A
Lunkenheimer	233	-



## 15000 - Mechanical

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### 3.4. Miscellaneous Notes:

1. All radiators, convectors, fin tube radiation, window units, shall be individually valved on supply and return.
2. Not used
3. Globe valves be of equivalent pressure ratings and manufacturer to that stated for gate valves.
4. Chilled water piping connections to air conditioning units shall include all necessary gate valves, air vent valves, drain connections and automatic valves.
5. Compression type, key operated air cocks shall be furnished and installed where required for additional venting. Cocks shall be 1/4" in size and shall be all bronze construction, at least one dozen keys shall be delivered to the Owner's representative for operating the cocks.
6. Drain cocks with threaded ends for hose connection shall be provided for any low points in the risers.

3.5 Flame Cutting: No cutting by torch shall be done without authorization from the Contracting Officer. Where flame cutting is authorized, at least one person shall be standing by exclusively with a fire extinguisher within 10 feet of the work and within full view of the area. The fire extinguisher shall have been inspected and certified by a licensed service agency within the last 12 months.

3.6 Welding: All welding shall be performed in compliance with ANSI B31.1 and/or ASME Boiler and Pressure Vessel Code Section IX, as applicable.

3.7 Restoration: All disturbed pavement, sodding, soil, and other objects shall be restored to match original condition. Pavement shall be restored with material to maintain the same load bearing capacity as the original or as directed by the Contracting Officer.

### 3.8 Valve Tags:

A. Each manually operated valve on any pipe line throughout the building which is furnished and installed as part of the HVAC work, except those valves at convectors, drips, indirect heater returns, water columns and water feeders, shall be provided with an identification tag. Tags shall be made of heavy brass or aluminum, or of white core plastic laminate. They shall be approximately 2-inches square, with rounded corners, and shall be attached to their respective valves by means of brass split key rings, brass hooks or by other approved method. The numbers shall be of block type, 1/2-inch high, engraved on plastic laminate tags and stamped on metal tags. The numbers on metal tags shall be filled with black enamel.

B. The numbering of valves shall be arranged in the following manner:

In Basement, Cellar, or Pipe Space Below

First Floor - No. 1 to No. 999

In First Story - No. 1000 to No. 1999.

In Second Story - No. 2000 to No. 2999.

In Third Story - No. 3000 to No. 3999.

In Fourth Story - No. 4000 to No. 4999.



On Roof or in Roof Penthouse or Buldhead

- No. R1 to No. R999

In no case shall a number applying to one story, be assigned to a valve located in another story.

3.9 Valve Charts:

- A. This Contractor shall prepare a chart with the valve identification number of each valve shown thereon. Opposite each valve number shall be printed the location of the valve bearing that number and its use or the apparatus or piping it controls. This chart shall be submitted to the Contracting Officer for approval before prints are made therefrom.
- B. After the chart has been approved, one (1) print shall be made therefrom which shall be framed under single or double thick glass and permanently secured to wall with screws or bolts where directed in the Mechanical Room or consult with the Contracting Officer. The frames shall be made of 1-inch wide oak picture molding with wood back, and shall be finished with natural color varnish.
- C. A typewritten copy of the valve chart shall be included in the "Manual of Operating Instructions"

3.10 Wheels, Etc.: Shut-Off valves shall have self-cooling type metal hand wheels excepting where specified otherwise herein. For valves other than outside screw and yoke type gate valves, the valve stem shall be extended through the wheel and provided with hexagon nuts to secure the wheel in place.

3.11 Chain and Sprockets: Where the drawings indicate valves to be chain operated, they shall be provided with operating chains, sprockets and guides, equal to those supplied by Crane Co., Rairbands Co., Jenkins Bros., or other approved make. Chains shall hang within 5'-6" of the floor. Provision shall be made for fastening the chains out of the way.

END OF SECTION 15100



## 15000 - Mechanical

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### SECTION 15120

#### MECHANICAL PIPING ACCESSORIES

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of piping accessories. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 Filters:

Pressure-temperature rating and filter medium particle size retention rating of the replacement filter shall equal or exceed the ratings of the existing filter. Pressure drop at the required capacity shall not exceed that of the replaced filter. Filters shall be constructed in accordance with ASME Code where applicable.

2.2 Strainers:

2.2.1 Provide and install where specified or where shown on the drawings, a strainer having a cast iron or semi-steel body and a removable screen of brass, monel or stainless steel. Strainers in pipes 2-inches and smaller shall be Y-type. Those in larger size pipe may be Y-type or basket type, with bolted cover and cleanout plug in bottom, and with closed bottom basket type screens. Strainers shall be designed for 125 psi (minimum) steam working pressure. They shall have screwed or flanged ends.

2.2.2 Strainers shall be one of the makes listed below or approved equal.

<u>Manufacturer</u>	<u>Type</u>	<u>Model</u>
Dunham-Bush, Inc.	Y	Type SSA or F211 A
Hoffman Specialty	Y	Series 400
McAleer	Y	Style SG
McAleer	Basket	Style No. 528-B
O.C. Keckley	Y	Style B
O.C. Keckley	Basket	Style D
Mueller Steam Specialty	Y	No. 11
Mueller Steam Specialty	Basket	No. 145, No. 165
Sarco Co.	Y	Type AT
Sarco Co.	Basket	Type 528B

2.3 Traps





Steam traps shall comply with ASME Code where applicable.

- 2.3.1 Thermostatic traps shall have bodies and caps of bronze or best steam metal. Seats and valve pins shall be made of stainless steel and/or monel. The multiple bellows or corrugated disc shall be made of copper alloy or other corrosion resistant metal of sufficient thickness and construction to prevent collapse. The maker's name or trade mark shall be cast in the cap and the designation number cast in the body of the traps for identification purposes.

- 2.3.1.1 Thermostatic traps shall be one of the approved makes listed below, or approved equal conforming to the requirements of the specifications. Traps shall be of the same make throughout the building. In a building addition or modernization, traps may be of a different make than those originally installed.

<u>Manufacturer</u>	<u>Model</u>
Barnes & Jones, Inc.	Type E
Dunham-Bush, Inc.	No. 1E, 2E, 3C
Hoffman Specialty	No. 17C, 8C
Sarco Co.	Type TS-25

- 2.3.1.2 If the Contracting Officer proposes to install a trap of a make not specified in (2.3.1.1), he shall submit complete shop drawings and a cut-away sample of the trap for approval, prior to installation.

- 2.3.2 Float and Thermostatic Traps shall have body and cover constructed of cast iron or semi-steel. Thermostatic element shall have stainless steel valve cone and valve seat. Provide stainless steel or seamless copper float.

- 2.3.2.1 Float-Thermostatic traps shall be one of the approved makes listed below. Traps of other makes, equal in all respects to those listed, will be considered for approval, providing that data of certified tests of performance and capacity as well as of tests of the thermostatic element and float under operating conditions, all made by a recognized university or testing laboratory approved by the Executive Director, are submitted. Traps shall be of the same make throughout the building. In a building addition or modernization, traps may be of a different make than those originally installed.

<u>Manufacturer</u>	<u>Model</u>
Barnes & Jones, Inc.	Type T
Dunham-Bush, Inc.	No. 40, No. 30,
Hoffman Specialty	Series 50
Sarco Co.	Type FT

- 2.3.3 Inverted Bucket Traps shall have body and cover constructed of cast iron or semi-steel. Bucket shall, with lever mechanism of heat-treated stainless steel.

- 2.3.4 Thermodynamic Traps shall have body and cover constructed of stainless steel. Disc shall be heat-treated stainless steel.

- 2.4 Expansion Joints shall comply with standards of the Expansion Joint Manufacturer's Association (EJMA). Replacement expansion joints shall equal or exceed the pressure-temperature ratings of the replaced expansion joints.



## 15000 - Mechanical

- 2.4.1 Expansion Compensators shall have 2 ply phosphor bronze bellow, brass shrouds, and end fittings for copper piping systems, or 2 ply stainless steel bellows, carbon steel shrouds, and end fittings for steel piping systems.
- 2.4.2 Rubber Expansion Joints shall be constructed of duck and butyl rubber with full-faced integral flanges, internally reinforced with steel retaining rings.
- 2.4.3 Slip Joints shall be of the type designed for repacking under pressure.
- 2.4.4 Flexible Ball Pipe Joints shall be designed for 360 degree rotation, with minimum of 30 degree angular flexing movement for sizes 1.4 inch to 6 inches, 15 degrees for sizes 8 inches and larger. Certify carbon steel joints for environmental shock testing. Joints shall comply with Section II of ASME Boiler and Pressure Vessel Code and ANSI B31.1 Power Piping for materials and design of pressure-containing parts and bolting.
- 2.4.5 Expansion Joints for Grooved Piping shall be combination couplings and nipples constructed of cut grooved short pipe nipples and couplings, or slip-type expansion joints constructed of carbon steel pipe and couplings.
- 2.5 Hangers and Pipe Supports - Plumbing
  - A. When support method is not shown on drawings, pipes laid underground shall be firmly bedded on solid ground under the body of the pipe. Where suitable bearing cannot be obtained because the ground has been disturbed by excavating, or for any other reason, the pipe shall be supported by concrete piers or approved brackets shall be installed at not more than 5'0" intervals. New or altered piping passing under cinder concrete areas shall be supported by hangers secured by means of beam clamps fastened to existing floor beams. Where pipe support spacing is excessive between existing steel, beam clamps shall be fastened to structural members that are furnished and installed by this Contractor and approved by the Contracting Officer. Removed fireproofing around beams shall be replaced to original condition. In existing reinforced concrete slabs, expansion bolts may be used which are approved equal to self drilling concrete anchors as manufactured by Phillips Drill Co. Hilti Inc. "Kwik bolts" are also approved for use in existing reinforced concrete slabs. In new concrete slabs, inserts shall be used as described in paragraph 2.5.3 of this section. No hangers or supports shall be attached to hung ceiling, cinder concrete, ductwork or work of other trades.
  - B. All overhead horizontal drains, vents supply or other piping shall be supported by adjustable wrought iron, steel or malleable iron hangers, made in accordance with details and at intervals no greater than herein, outlined. The metal decks shall not be used for support of piping or equipment.

Note: Installation of hangers and supports shall be done before the Contractor is ready for application of fireproofing material, and shall be primed and coated with one coat of red lead before installation.

  - 1. Cast iron soil and vent pipe. -- At 5 ft. intervals and within eighteen (18) inches of each hub or joint.
  - 2. Threaded pipe (1 in. or less). -- At 8 ft. intervals.
  - 3. Threaded pipe (1 1/4 in. or over). -- At 12 ft. intervals.
  - 4. Copper tubing (1 1/4 in. or less). -- At 6 ft. intervals.



5. Copper tubing (1 1/2 in. or over). -- At 10 ft. intervals.
  6. Plastic piping shall be supported by hangers at intervals not greater than 4-1/2 feet or continuously on a metal shelf or channel with hanger rods spaced at 10 foot intervals.
  7. Other Materials. As required for structural stability, service and as further stipulated in specifications and drawings.
- C. The gas, soil, waste and vent lines and vertical lines of water supply piping shall be supported at the base of the lines by brick or concrete piers, wrought-iron clamps, clevis type hangers or cradle type supports secured to the floor beams, walls or ceilings with beam clamps, expansion shields, knee brackets and 1/2" bolts. install pipe clamps, for gas and water risers and for soil, waste, vent and leader stacks. Intervals of supports for vertical piping shall be as follows:
1. Cast iron soil and vent pipe. At base and at each story height, but in no case at intervals greater than 20 ft.
  2. Threaded pipe. At every other story height, but in no case at intervals greater than 25 ft.
  3. Copper tubing -(Hard Temper). At each story height.
  4. Other materials. As required for structural stability and service.
- D. Not Used
- E. All pipe hangers in Cellar or Basement including pipe spaces and pipe chambers throughout the building shall be cleaned and painted.
- F. For vitrified pipe the bottom of trenches shall be carefully graded so as to provide an even bed for the full length of pipe with the bottom of the trench hollowed out for each hub. In rock trenches provide a bed of earth not less than six inches deep under the pipes. Also see Para. A. above.
- G. The Contractor shall furnish and set all brick and concrete piers, ties and planks that are required to support any or all of his piping.
- H. Groups of risers and horizontal running lines shall be provided with temporary spacers to maintain spacing and allow for separate pipe covering.
- I. Glass pipe installation shall be in strict accordance with the manufacturer's recommendation and the installation shall be supervised by the personnel of the glass pipe manufacturers or its bona fide distributor.

Glass piping shall be adequately supported as recommended by the piping manufacturer. The entire system shall be installed free of stress, metal hangers shall be of the clevis type. Standard for above ground drainage piping, suitable padded with a liner of 1/4" thick solid Neoprene or Buna-N-Rubber bonded to the bearing surface of the hanger, and spaced at not more than 10 foot centers. Horizontal branches of less than 8 foot in length shall be supported only at the bottom on the vertical riser. Riser supports shall be of type and spacing as recommended by the manufacturer.

#### 2.5.1 Pipe Hangers and Supports (HVAC)

##### A General



## 15000 - Mechanical

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Horizontal overhead pipes shall be supported by approved pipe hangers, spaced approximately 10-feet apart. Hangers for copper tubing shall be spaced approximately 8-feet apart. In all cases, spacing of hangers shall be such as to prevent sagging or the forming of pockets in the piping. Hangers shall not pass through ducts. Pipe hangers shall be manufactured by Fee & Mason Mfg. Co., F. & S. Central Mfg. Co., Grabler Mfg. Co., Grinnell Co. or approved equal.

### B Method of Attachment to Building Structure

#### 1. Floor Slabs of Structural Reinforced Concrete:

Piping shall be supported by hangers attached to beams, or to concrete inserts installed before the pouring of the floor slab. Refer to Par. 15B-8.05, regarding concrete inserts.

#### 2. Floor Slabs of Composite Metal Decks:

This type of construction consists of corrugated sheet steel and reinforced concrete, with steel beams. Overhead piping installed in areas having this type of construction shall be supported by hangers secured to beam clamps or to steel deck inserts. Steel deck inserts shall be as specified in Par. 15B-8.05

### C Insulated Piping

Each pipe hanger supporting insulated piping shall be provided with a pipe covering protection shield. Shield shall be the equal of F. & S. Central Figure 980 or Grinnell Figure 167.

### D Hangers for Pipes Smaller Than 5-inches

Each hanger for pipe sized small than 5-inches shall be forged or malleable iron ring type, or steel clevis type, supported by a solid steel rod.

Note: Rod size for sprinkler piping of 4 inch or 5 inch pipe size shall be 5/8 inch (see 15500 2.4 for more information on sprinkler systems).

### E Hangers for Pipes 5-inches and Larger

Each hanger for pipe sized 5-inches and larger shall be formed of a section of steel angle having a 3/4 inch diameter steel rod, threaded at both ends, run through a drilled hole near each end of the angle. Secure two nuts at the bottom end of the rod.

### F Sockets

Sockets used on upper ends of rods at beam clamps and on lower ends of rods for single hangers shall be malleable or forged steel with standard machine threads.

### G Pipe Supports

1. Mains located near floors shall be supported on roller type pipe stands, bedded in cement base. When mains are installed before concrete floor is laid, the mains shall be supported from overhead construction until the pipe stands can be put in place. Any work damaged in connection therewith shall be made good. Pipe roll stands shall be Fee & Mason Fig. 160, F. & S. Central Fig. 79, Grabler Fig 40A or Grinnell Fig. 271.

2. Horizontal piping connections (near Floor) to convectors, unit ventilators, indirect heaters, etc., located more than 4-feet from risers shall be support on adjustable iron pipe stands.



Pipe stand shall consist of a split ring extension hanger mounted on a hanger flange, secured to the floor. Split ring hanger shall be the equal of F. & S. Central's Fig. 4 with Fig. 6 hanger flange.

3. Piping in trenches shall be supported on special type hangers as approved by the Contracting Officer

H Painting

Pipe hangers, supports, stands, etc. shall be delivered to the site with one coat of red oxide or zinc chromate primer.

I Anchors

Where shown on the drawings, piping shall be anchored or braced to prevent vibration and excessive expansion at any one point. Anchors shall be in accordance with the Contracting Officer standards. Alternate methods of anchoring piping may be approved. Contractors shall submit detailed shop drawing of alternate method he proposes to use and obtain approval of same, prior to installation.

J Trench Covers

HVAC Contractor shall do necessary cutting and fitting of trench covers around pipes installed by him.

2.5.3 Inserts

- A. All piping, and equipment, hung from ceilings shall be properly supported from the ceiling slabs by means of required number of inserts. Inserts shall be installed in their proper locations before the pouring of the floor slabs. Inserts shall be furnished and installed by the Contractor together with all necessary drawings, etc. showing their proper locations, spacing, etc., in ample time to enable to the Contractor to install concrete work.
- B. Inserts for conventional reinforced poured concrete slabs shall be designed for insertion of heavy nuts suitable for screwing up to and including 3/4" rods. Inserts shall not be primed. All inserts shall be so installed that hangers will appear true and uniform. Insert No 650 made by Carpenter & Patterson, Insert No. 281 made by Grinnell, and "Insert No. 100" made by C. H. Leibfried Mfg. Corp., conforming with the above requirements will be approved. Submit shop drawings of insert with rod or strap attachment for approval.
- C. For composite metal deck, consisting of metal deck and conventional poured reinforced concrete, steel deck inserts shall be used. Steel deck inserts shall be of a type that is supported by the concrete slab and not by the metal deck. They shall be approved by the Contracting Officer shall be ITT Philips Drill Co.'s Red Head Steel Deck Inserts or approved equal. Insert size shall conform to the size of the hanger rod. Submit shop drawings of insert and rod for approval.
- D. Contractor shall take every precaution to furnish and set all sleeves, wood boxes of other devices that are required for proper installation of his work, before concrete is poured.

- 2.6 Valve Boxes shall be of cast iron, extension sleeve type; shall be not less than 5 inches in diameter; shall have a minimum thickness at any point of 3/16 inch; and shall be provided with cast-iron bases and covers. Covers shall have cast thereon an appropriate name designating the service for which



## 15000 - Mechanical

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the valve is used. All parts of valve boxes, bases, and covers shall be coated by dripping in bituminous varnish. Those used for building water/sprinkler supply shall comply with local codes.

### 2.7 Flexible Hoses:

2.7.1 Flexible Hoses for Non-Ferrous Piping shall be bronze hose covered with bronze wire braid with copper tube ends or bronze flanged ends, braze-welded to hose.

2.7.2 Flexible Hose for Ferrous Piping shall be stainless steel hose covered with stainless steel wire braid with NPT steel nipples or 150 psi ANSI flanges, welded to hose.

2.7.3 Rubber Flexible Hoses shall be rubber and butyl construction with integral full-faced duck and butyl flanges, internally steel wire reinforced, and furnished complete with steel retaining rings.

### 3.0 EXECUTION:

#### 3.1 Flame Cutting:

No cutting by torch shall be done without authorization from the Contracting Officer. Where flame cutting is authorized, at least one person shall be standing by exclusively with a fire extinguisher within 10 feet of the work and within full view of the area. The fire extinguisher shall have been inspected and certified by a licensed service agency within the last 12 months.

#### 3.2 Restoration:

All disturbed pavement, sodding, soil, and other objects shall be restored to match original condition. Pavement shall be restored with material to maintain the same load bearing capacity as the original.

#### 3.3 Welding:

All welding shall be performed in compliance with ANSI B31.1 and with ASME Code Section IX where applicable.

#### 3.4 Y-Type Strainers:

Shall be located in supply line ahead of the following equipment if integral strainer is not included in equipment.

- a. Pumps
- b. Steam traps serving steam main drips
- c. Temperature control valves
- d. Pressure reducing valves
- e. Temperature or pressure regulating valves
- f. Mixing/Diverting valves

#### 3.5 Installation of Steam Traps:

Install strainer ahead of trap if not integral with trap.

#### 3.6 Pipe Support Installation:

See Paragraph 2.5



3.7 Valve Boxes:

Shall be set plumb. Each valve box shall be placed directly over the valve it serves, with the top of the box brought flush with the finished grade. After being placed in proper position, earth shall be filled in around each valve box and thoroughly tamped on each side of the box.

3.8 Flexible Hoses:

Furnish and install flexible hose connections in each water line at the circulating pumps and at the chillers in the locations shown on the drawings. Hose shall be made of stainless steel with close pitch annular corrugations, and shall have metallic braid covering. It shall be Allied Metal Hose Co. Style SSC-1, Flexonics Series 400L-Type 321, Metraflex Co. Type SL, or approved equal. Submit shop drawings for approval.

END OF SECTION 15120



## SECTION 15141

### PUMPS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of pumps. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
  - 2.1 Worn or Damaged Pump Parts shall be replaced unless otherwise directed by the Contracting Officer. Notify Contracting Officer prior to work on pump.
  - 2.2 New Pump Impellers, when required, shall be statically balanced before installation and tailored for the TDH and GPM desired.
  - 2.3 Used Impellers from the same pump shall be checked for balance before reinstallation. Out of balance impellers shall either be balanced or replaced at contractor's expense.
  - 2.4 Close Coupled Pumps, when replaced, shall be replaced complete with motor.
- 3.0 EXECUTION:
  - 3.1 Before Any Work is started, the pump driver shall be locked out and tagged to prevent any driving power to the pump. The pump suction and discharge piping shall be valved off, locked, and tagged, or pipe line blanks shall be installed.
  - 3.2 Before Any Work is performed on pumps, the pump(s) must be vented and drained.
  - 3.3 Gaskets shall be replaced with the like material whenever a gasketed joint has been disturbed.
  - 3.4 Flexible Coupling Alignment shall be required if either the pump or motor mounting has been disturbed and shall be to the tolerances specified by the flexible coupling manufacturer.
  - 3.5 Removal and Installation of impellers shall be accomplished using pullers, jacks, crane, or hoist. Impact tools are strictly prohibited.
  - 3.6 Turbine Pumps removed from casings shall be lifted vertically to prevent damage to the pump or the pump casing.
  - 3.7 New Impeller Rings, Gaskets, and Strainer shall be installed before reassembly of turbine pumps.
  - 3.8 Relief Valve in discharge line for positive displacement pumps shall be set and tested at 110 percent of design discharge pressure or as recommended by pump manufacturer for service in which pump is used.
  - 3.9 Certified test curves of the pumps to be installed shall be provided for all pumps by the Manufacturer's agent and given to the Contracting Officer.





## 15000 - Mechanical

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- 3.10 Pump Foundations: Pumps and motors shall be set on footings and foundations of stone concrete. The pump and motor shall be set and connected as directed by the manufacturer or his agents, and bolted to pads provided therefore in the drip pan.
- 3.11 The Contractor shall submit shop drawings of the pump motors, angle frame and cover for approval before installing pumps.

END OF SECTION 15141



## SECTION 15161

### VIBRATION ISOLATION

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of vibration isolation. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

1.1 Submittals:

- A. Product Data: Submit manufacturer's technical product data and installation instructions for each type of vibration isolation.  
  
Submit schedule showing manufacturer's mounting sizes and guarantee deflections noted on the drawings.
- B. Shop Drawing: Submit shop drawings for the vibration isolating supports required for each item of HVAC equipments: Drawings showing the types of isolation supports and equipments bases being furnished, and the static deflection and efficiency to be attained.
- C. Record Drawings: Prior to project closeout, submit record drawings of installed vibration isolation system; in accordance with requirements of Division 1.
- D. Maintenance Data: Submit maintenance data and material lists for each type of vibration isolation system. Include this data, product data, shop drawings, and record drawings in maintenance manual in accordance with requirements of Division 1.

1.2 Quality Assurance:

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of vibration isolating materials, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Manufacturer's Regulating Requirements: Firms to determine vibration isolation sizes and locations and to provide, where necessary, field supervision and inspection to insure proper installation and performance.

2.0 PRODUCTS:

2.1 Approved Manufacturers: Subject to compliance with requirements, manufacturers offering vibration isolators and bases which may be incorporated in the work include, but are not limited to, the following:

Mason Industries, Inc., Hollis, New York

Vibration Eliminator Co., Long Island City, NY

Vibration Mountings and Controls Inc., Butler, NJ



Korfund Dynamics Co., Westbury, New York

2.2 Materials:

A. Spring Mounts:

1. Housed Spring Mounts: Spring type mounts shall consist of cast telescoping housings containing one or more steel springs. The mount shall be provided with built-in leveling bolt(s), resilient inserts of neoprene to act as guides for upper and lower housings and with ribbed guides for upper and lower housing shall have slotted holes in the base, to permit fastening of the mount to the floor when specified.
2. Free standing spring mounts shall be laterally stable without housing. Each mount shall be provided with a leveling bolt, a ribbed neoprene pad on the underside of the base, and means of securing the spring base to the floor when specified.

B. Neoprene-in-Shear Mounts: Each neoprene-in-shear type mount shall consist of a steel tip plate base plate completely enclosed in oil resistant neoprene. Top plate shall have a threaded bolt hole for attachment of equipment to mount. Base plate shall have bolt holes, to permit fastening of the mount to the floor when specified. Underside of base plate shall have ribbed, neoprene construction. Single neoprene-in-shear mounts shall have a maximum deflection of 0.25-inches. Double neoprene-in-shear mounts shall have a maximum deflection of 0.50-inches.

C. Hanger Type Isolators: Hanger type isolators shall consist of a steel housing incorporating a single or double neoprene-in-shear element or a steel spring, or a combination of these two isolators, as needed to achieve the required static deflection. Provide threaded rods for attachment of hanger to overhead structure and to equipment.

D. Steel Bases:

1. Integral structural steel brass for belt driven centrifugal fans shall be rectangular in shape, and each member shall be of wide flange seam or channel shaped cross-section. Bases for fans having motors in the X or Y position may be of "L" shape configuration. Depth of section shall be equal to minimum of 1/10th of the longest span of the equipment. Built-in adjustable motor slide rails shall be furnished as an integral part of the base. Joints shall be continuously welded.
2. Structural steel bases under air handling units shall be wide flange beams of size specified, or shown on drawing. Two beams shall be provided for an air handling unit, one under each side along the length of the unit and extending 6-inches beyond the ends. A steel bearing plate, 3/8-inch thick, shall be welded to the top flange of the beams at the location of each vibration isolator. The isolator shall be bolted to the bearing plate.

E. Inertia Blocks: An inertia block shall consist of a rectangular shaped reinforced concrete block, on which pumping equipment shall be mounted and which shall be supported on spring isolators above the floor. The pouring form for the isolators above the floor. The pouring form for the block shall be made of 6-inch (minimum height) steel channels welded together and shall include reinforcing bars running in two directions, welded in place or welding wire fabric. Anchor bolts for the pump's base shall be secured within the pouring form. The number and location of brackets for mounting isolating springs shall be determined by vibration isolation manufacturer. Pouring form shall include space for the pump inlet base elbow. Concrete shall be poured at the site by the Contractor. Design and fabrication of the pouring form, including all



## 15000 - Mechanical

of its parts, shall be the responsibility of the vibration isolation equipment manufacturer. Pump support shall be designed to provide 95% (minimum) vibration isolation.

- F. Floating Pad System: The floating pad shall be isolated from the building structure by means of 2-inch high neoprene isolators, factory bonded to the underside of 1/2-inch thick exterior grade plywood. Placement and density of isolators shall be in accordance with load requirements and with recommendation of vibration isolation manufacturer. Line interior face of the curb with 1-inch thick light density cork. Cover the plywood form with a sheet of polyethylene film, overlapping the cork boards and curbs. Pour a 6-inch thick reinforced concrete pad on top of the polyethylene film, inside the cork boards. After the concrete has set, remove the excess polyethylene film, and fill the joint between the pad and the curb with 3-M Co.'s EC-801, or equivalent mastic seal.

### 3.0 EXECUTION:

#### 3.1 Preparation:

- A. For vibration isolation equipment installed indoors, all metal parts, including rails and bases, shall be painted at the factory with one coat of red oxide paint and one coat of aluminum paint. Other means or rust resisting painting may be accepted, subject to prior approval.
- B. Vibration isolation equipment installed outdoors shall have all steel parts hot dipped galvanized, all bolts cadmium plated, and all springs cadmium plated and neoprene coated.

#### 3.2 Installation:

- A. At each equipment location, provide the required deflection under the imposed load and produce uniform loading and deflection even when equipment weight is not evenly distributed. Jack inertia blocks and bases into position and wedge in place before spring loading; leveling bolts shall not be used as jacking screws. After equipment is in place and springs are loaded through leveling bolts, remove wedges and jacks. Isolators shall be suitable for the lowest operating speed of the equipment.
- B. Where the floor is waterproofed or finished with waterproof cement, install vibration isolation in such manner that the waterproofing is not damaged.
- C. Isolation equipment shall be in accordance with the following table:

<u>Lowest RPM</u>	<u>Inches Deflection (Min.)</u>	<u>% Efficiency</u>	<u>Type</u>
1750 and over	.25	95	Single neoprene-in shear
1200-1749	.50	95	Double neoprene-in-shear
1000-1199	.75	95	Spring
570-999	1.25	90-95	Spring
520-569	1.5	90	Spring
330-519	2.0	80-90	Spring
Up to 329	3.5	80	Spring



- D. Install combination spring and double deflection neoprene position hangers for all refrigeration piping located in the Equipment Room.
- E. Install combination spring and double deflection neoprene position hangers for the suction and discharge piping at each circulating pump in the hot and/or chilled water system. Each hanger shall be located on the pump side of the flexible hose connection specified in Section 15060 Para. 2.01 (E-12).
- F. Each liquid chiller unit shall be installed on the concrete pad on free-standing spring type isolators having a static deflection of at least 1-inch. Isolators shall provide a minimum isolating efficiency of 95%.
- G. Use housed spring mounts on certain air mixing equipment and chillers located in cellar or basement.
- H. Use free standing spring mount where a floating pad system or an inertia block is specified.
- 3.3 Inspection: On completion of the vibration isolation system herein specified. The representative of the isolation materials manufacturer shall inspect the completed systems and report in writing any installation error. Improperly selected isolation devices, or other faults that could affect steps taken to properly complete the isolation work. Both of these reports shall be reviewed by the Contracting Officer for final approval.
- 3.4 Schedule: Provide vibration isolation supports for HVAC equipment as indicated in this schedule.

<u>Equipment</u>	<u>Location</u>	<u>Type of Support</u>
Centrifugal fan, belt driven	floor mounted	integral steel base with isolators
Multizone unit	floor mounted	springs on 6" W.F. beams
A.C. single zone unit (vertical)	floor mounted	springs on 6" W.F. beams
H. and V. unit (vertical)	floor mounted	springs on 6" W.F. beams
H. and V. unit (horizontal)	floor mounted	springs on 10" W.F. beams
A.C. single zone unit (horizontal)	floor mounted	springs on 10" W.F. beams
Air handling unit	overhead supported	spring and double deflecting neoprene hangers
Chiller, reciprocating	cellar/basement	springs with 2" min. static deflection
Chiller, reciprocating	upper floor	floating pad
Pump, all H.P.	cellar/basement	none required
Pump, 5 H.P. or more	upper floor	inertia block
Pump, under 5 H.P.	upper floor	none required
Pipe, refrigerant	equipment room	spring and D.D.* hanger
Pipe, hot and/or chilled water	at pumps	spring and D.D.* hanger

\*D.D. = Double Deflecting

END OF SECTION 15161



## SECTION 15173

### METERS AND GAGES

#### I.0 GENERAL

##### 1.1 SUMMARY

A. This Section includes the following types of Materials and Gages:

1. Temperature gages and fittings.
2. Pressure gages and fittings.
3. Flow meters.

##### 1.2 SUBMITTALS

A. General: Submit the following in accordance with conditions of Contract and Division I Specification Sections.

1. Product data for each type of meter and gage. Include scale range, ratings.
2. Product certificates signed by manufacturers of meters and gages certifying accuracy's under specified operating conditions and products' compliance with specified requirements.
3. Maintenance data for each type of meter and gage for inclusion in Operating and Maintenance Manuals specified in Division 1 and Division 15 Section "Basic Mechanical Requirements."

##### 1.4 QUALITY ASSURANCE

- A. UL compliance: Comply with applicable UL standards pertaining to meters and gages.
- B. ASME and ISA Compliance: Comply with applicable portions of ASME and Instrument Society of America (ISA) standards pertaining to construction and installation of meters and gages.

#### 2.0 - PRODUCTS

##### 2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include but are not limited to the following:
- B. Manufactures: Subject to compliance with requirements, provide products by one of the following:
- I. Mercury-In-Glass Thermometers:
    - a. Marshalltown Instruments, Inc.
    - b. Terrice (H.O.) Co.



- c. Weiss Instruments, Inc.
- d. Weksler Instruments Corp.
- 2. Direct-Mount Filled-System Dial Thermometers:
  - a. Ashcroft Dresser Industries Instrument Div.
  - b. Marsh Instrument Co., Unit of General Signal.
  - c. Terice (H.O.) Co.
  - d. Weiss Instruments, Inc.
  - e. Weksler Instruments Corp.
- 3. Remote-Reading Filled-System Dial Thermometers:
  - a. Ametek, U.S. Gauge Div.
  - b. Ashcroft Dresser Industries Instrument Div.
  - c. Marsh Instrument Co., Unit of General Signal.
  - d. Tel-Tru Manufacturing Co., Inc.
  - e. Terice (H.O.) Co.
  - f. Weiss Instruments, Inc.
  - g. Weksler Instruments Corp.
- 4. Brmetal Dial Thermometers:
  - a. Ashcroft Dresser Industries Instrument Div.
  - b. Marshalltown Instruments, Inc.
  - c. Tel-Tru Manufacturing Co., Inc.
  - d. Terice (H.O.) Co.
  - e. Weiss Instruments, inc.
  - f. Weksler Instruments Corp.
- 5. Thermometer Wells: Same as for thermometers.
- 6. Insertion Dial Thermometers:
  - a. Ashcroft Dresser Industries Instrument Div.
  - b. Tel-Tru Manufacturing Co. , Inc.
  - c. Terice (H.O.) Co.
  - d. Weiss instruments, Inc.
  - e. Weksler Instruments Corp.
- 7. Pressure Gages:
  - a. Ametek, U.S. Gauge Div.
  - b. Ashcroft Dresser IndustriesInstrument Div.



## 15000 - Mechanical

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- c. Marsh instrument Co., Unit of General Signal.
- d. Marshalltown instruments, Inc.
- e. Terice (H.O.) Co.
- f. Weiss instruments, Inc.
- g. Weksler instruments Corp.
- h. WIKA instruments Corp.
- 8. Pressure Gage Accessories: Same as for pressure gages.
- 9. Venturi-Type Flow Measurement System:
  - a. Armstrong Pumps, Inc.
  - b. Barco Div., Marison Industries.
  - c. Gerand Engineering Co.
- 10. Flow Meters:
  - a. Armstrong Pumps, Inc.
  - b. Metraflex Co.
- 11. Test Plugs:
  - a. MG Piping Products Co.
  - b. Peterson Equipment Co. , Inc.
  - c. Sisco, A Spedco, Inc. Co.
  - d. Terice (H.O.) Co.
  - e. Watts Regulator Co.

### 2.2 THERMOMETERS, GENERAL

- A. Accuracy: Plus or minus 1 percent of range span or plus or minus one scale division to maximum of 1.5 percent of range span.
- B. Scale Range: Temperature ranges for services listed as follows:
  - 1. Domestic Hot Water: 30 to 240 deg F with 2-degree scale divisions (0 to 115 deg C with 1-degree scale divisions).
  - 2. Domestic Cold Water: 0 to 100 deg F with 2-degree scale divisions (minus 18 to 38 deg C with 1-degree scale divisions).
  - 3. Hot Water: 30 to 300 deg F with 2-degree scale divisions (0 to 150 deg C with 1-degree scale divisions).
  - 4. Condensed Water: 0 to 160 deg F with 2-degree scale divisions (minus 18 to 70 deg C with 1-degree scale divisions).
  - 5. Chilled Water: 0 to 100 deg F with 2-degree scale divisions (minus 18 to 38 deg C with 1-degree scale divisions).





2.3 MERCURY-IN-GLASS THERMOMETERS

- A. Case: Die cast, aluminum finished, in baked epoxy enamel, glass front, spring secured, 9 inches long.
- B. Adjustable Joint: Finished to match case, 180-degree adjustment in vertical plane, 360-degree adjustment in horizontal plane, with locking device.
- C. Tube: Red reading, mercury filled, magnifying lens.
- D. Scale: Satin-faced, non-reflective aluminum, with permanently etched markings.
- E. Stem: Copper-plated steel, aluminum or brass, for separable socket, length to suit installation.

2.4 DIRECT-MOUNT FILLED-SYSTEM DIAL THERMOMETERS

- A. Type: Vapor actuated, universal angle
- B. Case: Drawn steel or cast aluminum, glass lens, 4-1/2-inch diameter.
- C. Adjustable Joint: Finish to match case, 180-degree adjustment in vertical plane, 360-degree adjustment in horizontal plane, with locking device.
- D. Thermal **Bulb**: Copper with phosphor bronze bourdon pressure tube.
- E. Movement: Brass, precision geared.
- F. Scale: Progressive, satin faced, non-reflective aluminum, permanently etched markings.
- G. Stem: Copper-plated steel, aluminum, or brass, for separable socket, length to suit installation.

2.5 REMOTE-READING FILLED-SYSTEM DIAL THERMOMETERS

- A. Type: Vapor actuated.
- B. Case: Drawn steel or cast aluminum, glass lens, 4-1/2-inch diameter.
- C. Movement: Brass, precision geared.
- D. Scale: Progressive, satin faced, non-reflective aluminum, permanently etched markings.
- E. Tubing: Bronze double-braided armor over copper capillary, length to suit installation.
- F. Bulb: Copper with separable socket for liquids, averaging element for air.

2.6 BIMETAL DIAL THERMOMETERS

- A. Type: Direct mounted, bimetal, universal angle.
- B. Case: Stainless steel, glass lens, 5-inch diameter.
- C. Adjustable Joint: Finish to match case, 180-degree adjustment in vertical plane, 360-degree adjustment in horizontal plane, with locking device.
- D. Element: Bimetal coil.
- E. Scale: Satin faced, non-reflective aluminum, permanently etched marking.
- F. Stem: Stainless steel for separable socket, length to suit installation.



## 15000 - Mechanical

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### 2.7 DIAL-TYPE INSERTION THERMOMETERS

- A. Type: Bimetal, stainless steel case and stem, 1-inch-diameter dial, dust- and leakproof 1/8-inch-diameter tapered-end stem with nominal length of 5 inches.

### 2.8 THERMOMETER WELLS

- A. Thermometer Wells: Brass or stainless steel, pressure rated to match piping system design pressure; with 2-inch extension for insulated piping and threaded cap nut with chain permanently fastened to well and cap.

### 2.9 PRESSURE GAGES

- A. Type: General use, ASME B40.1, Grade A, phosphor bronze bourdon- tube type, bottom connection.
- B. Case: Drawn steel or brass, glass lens, 4-1/2-inches diameter.
- C. Connector: Brass, 1/4-inch NPS.
- D. Scale: White coated aluminum, with permanently etched markings.
- E. Accuracy: Plus or minus 1 percent of range span.
- F. Range: Conform to the following:
  - 1. Vacuum: 30 inches Hg to 15 psi.
  - 2. All fluids: 2 times operating pressure.

### 2.10 PRESSURE GAGE ACCESSORIES

- A. Syphon: 1/4-inch NPS straight coil constructed of brass tubing with threads on each end.
- B. Snubber: 1/4-inch NPS brass bushing with corrosion-resistant porous metal disc. Disc material shall be suitable for fluid served and rated pressure.

### 2.11 FLOW METERS, GENERAL

- A. Flow rate of elements and meters shall be same as connected equipment or system.

### 2.12 VENTURI-TYPE FLOW ELEMENTS

- A. Type: Differential-pressure venturi type, designed for installation in piping.
- B. Construction: Bronze or cadmium-plated steel with brass fittings and attached tag with flow conversion data. Ends shall be threaded for 2 inches and smaller elements and flanged or welded for 2-1/2 inches and larger elements.

### 2.13 METERS

- A. Permanently Mounted Meters: Suitable for mounting on wall or bracket, 6-inch dial or equivalent with fittings and copper tubing for connecting to flow element.
- B. Scale shall be in gpm unless otherwise indicated.
- C. Accuracy: Plus or minus 1 percent between 20 to 80 percent of range.

### 2.14 TEST PLUGS



- A. Test Plugs shall be nickel-plated brass body, with 1/2-inch NPS fitting and 2 self-sealing valve-type core inserts, suitable for inserting a 1/8-inch O.D. probe assembly from a dial-type thermometer or pressure gage. Test plug shall have gasketed and threaded cap with retention chain and body of length to extend beyond insulation. Pressure rating shall be 500 psig.
- B. Core Material: Conform to the following for fluid and temperature range:
  - 1. Air, Water, Oil, and Gas, 20 to 200 deg F (minus 7 to 93 deg C): Neoprene.
  - 2. Air and Water, minus 30 deg to 275 deg F (minus 35 to 136 deg C):
- C. Test Kit: Provide test kit consisting of 1 pressure gage, gage adapter with probe, 2 bimetal dial thermometers, and carrying case.
- D. Ranges of pressure gage and thermometers shall be approximately 2 times systems operating conditions.

### 3.0 - EXECUTION

#### 3.1 THERMOMETERS INSTALLATION

- A. Install thermometers in vertical and tilted positions to allow reading by observer standing on floor.
- B. Install in the following locations and elsewhere as indicated:
  - 1. At inlet and outlet of each hydropic zone.
  - 2. At inlet and outlet of each hydropic boiler and chiller.
  - 3. At inlet and outlet of each hydronic coil in air-handling units and built-up central systems.
  - 4. At inlet and outlet of each hydropic heat exchanger.
- C. Thermometer Wells: Install in piping tee where thermometers are indicated, in vertical position. Fill well with oil or graphite and secure cap.

#### 3.2 INSTALLATION OF PRESSURE GAGES

- A. Install pressure gages in piping tee with pressure gage valve, located on pipe at most readable position.
- B. Install in the following locations, and elsewhere as indicated:
  - 1. At suction and discharge of each pump.
  - 2. At discharge of each pressure-reducing valve.
  - 3. At building water service entrance.
  - 4. At chilled water and condenser water inlets and outlets of chillers.
- C. Pressure Gage Needle Valves: install in piping tee with snubber.

#### 3.3 INSTALLATION OF TEST PLUGS

- A. Test Plugs: Install in piping tee where indicated, located on pipe at most readable position. Secure cap.



## 15000 - Mechanical

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### 3.4 INSTALLATION OF FLOW-MEASURING ELEMENTS AND METERS

- A. General: install flow meters for piping systems located in accessible locations at most readable position.
- B. Locations: install flow measuring elements and meters in the following locations and elsewhere as indicated.
  - 1. At discharge of each pump.
- C. Differential-Pressure Type Flow Elements: install minimum straight lengths of pipe upstream and downstream from element as prescribed by the manufacturer's installation instructions.
- D. Meters For Use With Flow Elements: install meters on wall or bracket in accessible location.
- E. Install connections, tubing, and accessories between flow elements and meters as prescribed by the manufacturer's installation instructions.

### 3.5 ADJUSTING AND CLEANING

- A. Adjusting: Adjust faces of meters and gages to proper angle for best visibility.
- B. Cleaning: Clean windows of meters and gages and factory-finished surfaces. Replace cracked and broken windows, and repair scratched and marred surfaces with manufacturer's touch-up paint.

### 3.6 CONNECTIONS

- A. Piping installation requirements are specified in other sections of Division 15. The drawings indicate the general arrangement of piping, fittings, and specialties.

The following are specific connection requirements:

- 1. Install meters and gages piping adjacent to machine to allow servicing and maintaining of machine.

END OF SECTION 15173



## SECTION 15176

## STEEL TANKS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of steel tanks. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.0.1 General:

- A. Shop drawings, including computations for head thickness of the tank, and drawings of the steam coil must be submitted before approval by the Contracting Officer
- B. For size of tank; length and size of removable heating coil; water heating capacity; air compressor size; pump size; etc., see Amendments and drawings.

2.1 Tank Materials:

- A. Tank shall be a horizontal with a 11 x 15 manhole and shall be constructed of steel complying with ASTM Spec. A-285 Grade "C" with a minimum tensile strength of 55,000 psi for diameters up to 48". For diameters over 48" the steel shall comply with ASTM Spec. A-212 grade "B" or A-515 Grade 70 with a minimum tensile strength of 70,000 psi.
- B. Heads shall be seamless ellipsoidal with skirt or seamless torisspherical with skirt. The thickness shall be computed in accordance with the latest edition of the ASME Boiler and Pressure Vessel Code, Section VIII Unified Pressure Vessels. With an additional 1/16" added to the computed thickness for corrosion allowance.
- C. Shells shall have a minimum thickness in accordance with the following table.

Diam. Shell Thick.		Diam. Shell Thick.		Diam Shell Thick.	
18"	.212	54"	.395	90"	.616
24	.262	60	.432	96	.653
30	.313	66	.469	102	.690
36	.363	72	.506	108	.727
42	.413	78	.543	114	.764
48	.464	84	.579	120	.801

2.1.1 Cement Lined Tanks:

- A. The tank shall be thoroughly cleaned and the entire interior given a cement wash and a coating of cement applied in a total thickness of approx. 3/4" in not less than 2 applications and troweled to a smooth finish. Cement lining shall be one(1) or approved equal to the following:

- 1. Ford Tank Maint, Co., Inc. - "CIMCO"



## 15000 - Mechanical

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2. American Pipe and Tank Lining Co. - "AMPLICO"
3. A.S.G. Pipe Lining Co. - "Perm-O-Line"
4. Atlas Tank Maint. Co. - "HYDRAULIC CEMENT"
5. Patterson Kelly Co., Inc.

- B. In the application of the cement lining, due precautions shall be taken to prevent cement from entering into or interfering in any manner with pipes, openings, or any accessories connected to the tank.
- C. After all cement work has been completed, inspected and approved, the manhole shall be installed. Approximately 6 hours after the cement lining has been completed, the tank shall be slowly filled with water. The normal water pressure at the building shall be maintained in the tank while the cement is in the plastic state, in order that the cement lining will be expanded to follow the contour and changing form of the tank under pressure.

2.2. Storage tanks for flammable liquids shall also comply with UL and NFPA requirements.

2.3 Nozzle Flange Diameters and Drillings shall be in compliance with ANSI B16.5.

2.4 Butt Weld Nozzles shall be in compliance with ANSI B16.25.

3.0 EXECUTION:

3.1 The construction of the tank and all connections to the tank shall be in accordance with the latest revision of the ASME Boiler and Pressure Vessel Code, Section VIII Unfired Pressure Vessels. Tank shall have a working pressure of 150 psi and be tested hydrostatically at 300 psi. All joints shall be double butt welded. Radiographic inspection not required.

3.2 Manufacturers data report, as specified in ASME Boiler and Pressure Vessel Code, Section VIII Unfired Pressure Vessels and certified by an approved inspection agency, shall be furnished in triplicate.

END OF SECTION 15176



## SECTION 15177

### FIBERGLASS TANKS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of fiberglass tanks. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with each of the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work and environmentally acceptable to the Environmental Protection Agency.
- 2.0 PRODUCTS:
  - 2.1 Tank Material shall be reinforced fiberglass polyester in compliance with ASTM C 582 for tanks in hydrocarbon service.
  - 2.2 New Tanks shall be horizontal, cylindrical tanks and shall comply with ASTM D 3299 as applicable. Chemical resistance tests, when required, shall be performed at the fabrication shop in compliance with ASTM C 581.
  - 2.3 Nozzle Flange Diameters and Drillings shall be in compliance with ANSI B16.5.
- 3.0 EXECUTION:
  - 3.1 Repair and installation work shall be performed in compliance with recommended procedures and practices of SPI and of PPI.
  - 3.2 Complete installation checklist according to Pub. No. 15-PE-8894.
  - 3.3 Single wall tanks for underground use, Pub. No. 3-PE-6312; Double wall tank for underground use, Pub. No. 3-PE-16207
  - 3.4 Bed and Backfill according to ASTM-C-33
  - 3.5 Installation procedures according to 3-PE-6304
  - 3.6 Wiring according to NEC with THHN or MTW
  - 3.7 Single circuit control panel equal to Owens Corning SB-0011B single control circuit and SB-0014B four circuit control panel.

END OF SECTION 15177



## SECTION 15182

### INSULATION FOR ABOVEGROUND PIPE

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of insulation for aboveground pipe. Products shall match existing materials and/or shall be as directed by the Contracting Officer. All insulation materials shall be free of asbestos.. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work and according to rules by the EPA.

2.0 PRODUCTS:

2.1 Insulation shall be in accordance with the following.

A. Pipe insulation, as well as the adhesives and finishing facings or jackets used therewith shall have a flame spread rating not over 25 without evidence of continued progressive combustion. Adhesives and coatings shall be fire retardant type.

B. Approved Manufacturers

Insulation manufactured by Certain-Teed Corp., or Owens-Corning Fiberglas Corp., complying with the requirements of the specifications are approved. Adhesives manufactured by Benjamin Foster Co., Epolux Manufacturing Corp., or InsulCoustic (Division of Birma Products Corp.), complying with the requirements of the specifications are approved. All insulating materials, adhesives, etc. shall be delivered to the project in containers and/or cartons which are clearly marked with the manufacturer's name and brand.

Service Temperature, F

60 F and below

Insulation Material.

Cellular glass, ASTM C552  
(cold piping) or mineral fiber

2.2 Thermal Insulation for Piping:

A. All pipe insulation shall be one-piece, molded sectional fiberglass, having a nominal 4-pound density. Its thermal conductivity shall not exceed 0.23 at 75°F mean temperature. It shall be suitable for use on piping up to 370°F. Insulation for hot water piping shall be 1-inch thick for pipe sizes up to and including 3-inches, and shall be 2-inches thick for larger pipe sizes. Insulation for fuel oil, refrigerant, cold and chilled water piping shall be 1-inch thick. Insulation for (hot and/or chilled water) piping shall be of the thickness specified for hot water piping insulation or chilled water piping insulation, and shall have the vapor barrier jacket specified for chilled water. All insulation joints shall be firmly butted together and sealed against vapor transmission.

Note: The use of "A.P. Armflex" pipe insulation, manufactured by Armstrong Cork Co., is acceptable.

B. Valves, fittings, etc., for fuel oil, refrigerant, steam or hot water piping shall be insulated as follows:





1. For pipe sizes smaller than 4-inches, one of the following ways shall be used:
    - (a) Apply insulating cement to a thickness equal to adjoining pipe insulation and trowel to a smooth finish.
    - (b) Wrap with compressed 1-pound density fiberglass blanket equal in thickness to adjoining insulation. Secure with No. 16-gauge galvanized soft annealed steel wire. Finish with a smooth coat of insulating cement.
  2. For pipe sizes 4-inches and larger, fit segments of pipe insulation and secure with No. 16-gauge galvanized soft annealed steel wire. Finish with a smooth coat of insulating cement.
  3. In lieu of the foregoing methods, the use of pre-molded fiberglass fittings of same thickness, as adjoining pipe insulation will be accepted. Finish with a smooth coat of insulating cement and seal joints.
- C. Valves, fittings, etc. for cold water piping, drainage piping, including polypropylene piping shall be insulated as follows:
1. For pipe sizes smaller than 4-inches wrap firmly under a minimum of a 3:1 compression, with 1 pound density fiberglass blanket, to a thickness equal to adjoining insulation. Secure with No.20 gauge galvanized annealed steel wire. Finish with a smooth coat of insulating cement.
  2. For pipe sizes 4 inches and larger, fit segments of pipe insulation equal in thickness to adjoining insulation and secure with No. 20 gauge galvanized annealed steel wire. Finish with a smooth coat of insulating cement.
  3. In lieu of the foregoing methods, the use of pre-molded fiberglass fittings of the same thickness of adjoining pipe insulation will be accepted. Finish with a smooth coat of insulating cement..
- D. Valves, fittings, etc. for chilled water piping shall be insulated with either pre-molded fiberglass fittings, fiberglass blanket, or with segments of pipe insulation wired in place. In addition, the insulation shall be vapor sealed by applying vapor barrier coating to all cut edges and joints, and then covering the entire fitting with glass fabric tape embedded between two 1/16-inch thick coats of vapor barrier coating. Lap seal glass tape at least 2-inches on itself and adjoining insulation.
- 2.3. Facing or Jackets:
1. Refrigerant, steam and hot water piping

Insulation on refrigerant, suction piping, steam and hot water piping shall have a jacket of white kraft paper outer surface bonded to aluminum foil and reinforced with fiberglass yarn. Kraft paper shall be permanently treated so that it will retain its flame-spread and smoke-developed ratings. Longitudinal laps shall be secured with outward clinch, coated 9/16-inch staples on 4-inch maximum center. Each edge and end lap of butt strips shall also be stapled. Insulation shall be additionally secured with 3/4-inch wide aluminum bands installed on 12-inch (maximum) centers. Valves, fittings, etc. shall have a jacket of fiberglass fitting cloth smoothly adhered with lagging adhesive. Lap cloth on itself and adjoining insulation: 1-inch lap on 3-inch and smaller pipe, and 2-inches of larger pipe sizes.



## 15000 - Mechanical

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### 2. Chilled water, cold water, polypropylene piping

Insulation on chilled water and cold water piping shall have a vapor barrier jacket of white kraft paper outer surface bonded to aluminum foil and reinforced with fiberglass yarn. Longitudinal laps and butt strips shall be smoothly secured with insulation adhesive. The use of staples on vapor barrier jacketed insulation is not permitted.

Note: The use of pipe insulation having a "self-sealing" lap and "self-sealing" lap strips is acceptable.

END OF SECTION 15182



## SECTION 15183

### INSULATION FOR UNDERGROUND PIPE

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of insulation for underground pipe. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work and removal shall be performed according to EPA's requirements.
- 2.0 PRODUCTS :
- 2.1 Insulation for Underground Systems shall be calcium silicate complying with ASTM C 533 or polyurethane foam for low temperature systems (250 F and below).
- 2.2 Insulation Jackets for Conduit Systems shall be cast iron complying with ASTM A377 or epoxy-coated spiral weld steel conduit for high temperature systems (above 250 F) ; or shall be polyvinyl chloride complying with ASTM D 1785 or fiberglass reinforced plastic for low temperature systems (250 F and below).
- 3.0 EXECUTION:
- 3.1 Backfill on Pipe System shall be 12 inches minimum.
- 3.2 Ground Surface shall be resodded or otherwise restored to the condition existing prior to the work.
- END OF SECTION 15183



## SECTION 15184

### BOILER FIREBOX INSULATION

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of boiler firebox insulation. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
  - 2.1 Block or Board Insulation:
    - 2.1.1 Mineral Fiber Rock, Slag, or Glass in accordance with ASTM C 612.
    - 2.1.2 Diatomaceous-Earth in accordance with ASTM C 517.
    - 2.1.3 Calcium Silicate in accordance with ASTM C 533.
    - 2.1.4 Cellular Glass in accordance with ASTM C 552.
    - 2.1.5 Cellular Polyurethane in accordance with ASTM C 591.
    - 2.1.6 Expanded Perlite in accordance with ASTM C 610.
  - 2.2 Blanket Insulation: Mineral fiber rock, slag, or glass in accordance with ASTM C 553 or ASTM C 592.
  - 2.3 Loose Fill Insulation:
    - 2.3.1 Mineral Fiber Rock, Slag, or Glass in accordance with ASTM C 764.
    - 2.3.2 Vermiculite in accordance with ASTM C 516.
    - 2.3.3 Perlite in accordance with ASTM C 549.
  - 2.4 Insulating Cement:
    - 2.4.1 Mineral Fiber Rock, Slag, or Glass in accordance with ASTM C 195 or ASTM C 449.
    - 2.4.2 Exfoliated Vermiculite in accordance with ASTM C 196.
  - 2.5 Castable Refractory
    - 2.5.1 Castable refractory for boiler linings shall be made of insulating castable refractory having a maximum temperature rating of 2800 F. and shall be A.P. Green's "Super Kast-Set", General Refractories' "Super Ferro-Cast", Harbison Walder's "H-W Super Castable", J.H. France's "Hydrecon 5", or Kaiser Refractories' "Super Furnas-Crete".
    - 2.5.2 Furnish and install a refractory floor of 4-inch minimum thickness in each return tubular firebox boiler during the two week period immediately prior to the installation of the oil burner. Do not install the refractory when the air temperature in the boiler room is at or below 32 F. Deliver refractory to boiler



room in containers marked with manufacturer's name and brand. Mix and apply refractory in accordance with manufacturer's directions. Curing and firing of refractory shall also be in accordance with his directions.

- 2.6 Spray-Applied Fibrous Insulation in accordance with ASTM C 720 and ASTM C 762.
- 2.7 Refractory Supports attached to pressure parts of the boiler shall comply with the ASME Boiler and Pressure Vessel Code.
- 2.8 Plastic Refractory: All plastic refractory shall be air setting type, of super duty quality, and shall have a pyrometric cone equivalent not less than cone 32 1/2 (3135 F.) Plastic refractory shall be installed by the pounding method and shall be securely anchored to the adjacent work by means of heat resisting alloy iron or refractory anchors or combination of both, and ample provision shall be made for expansion. Plastic refractory shall be A.P. Green's "Super Hybond (air setting)", General Refractories' "Super Brick Ram Mix G (air setting)", Harbison Walker's "Super Plastic CS (air setting)", J.H. France's "Super Franco Plastic (air setting)", Kaiser's "Max Bond (air setting)", or North America's "Narco-Spar (air setting)".
- 2.9 Fire Brick (High Alumina):
- 2.9.1 The fire brick in the windbox extension front shall be high alumina, made of Missouri or Pennsylvania clay by the dry press method, true and regular in shape and size and shall have the maker's brand molded in each brick.
- 2.9.2 The brick shall have a pyrometric cone equivalent not below cone 35, shall have an alumina content to not less than 60% ( $\pm 2.5\%$ ) and shall comply in every respect with the latest revised specification of the American Society for Testing Materials.
- 2.9.3 Approved Makes and Brands: The following makes and brands of fire brick, subject to the above specified requirements, are approved. No other make or brand shall be used unless specified by Amendment. Contractor shall furnish the Contracting Officer with two (2) samples of the brick he proposes to furnish for the particular job. Samples shall be accompanied by a certified laboratory report and by a letter signed by an officer of the firm manufacturing the brick, stating that all brick and bonding mortar furnished for the particular job are in complete compliance with the specification requirements.

A.P. Green Company	Missou
General Refractories Company	ARCO-60
Harbison-Walker Company	ANCHOR
J.H. France	FRANCO
Kaiser Refractories	ALUMEX-60
North American Company	NARCAL-60

- 2.10 Bonding Mortar for Fire Brick: All fire brick shall be laid in just sufficient air-setting high temperature bonding mortar to give an even and solid bearing and a tight joint. Care shall be taken that the mortar spreads over the entire surface of the brick. Bonding mortar shall be of the same manufacture as the fire brick used and shall be one of the following:

A.P. Green Company	"Sairset"
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## 15000 - Mechanical

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General Refractories Company	"Brikbond A"
Harbison-Walker Company	"Harwaco Bond"
J.H. France	"Franset"
Kaiser Refractories	"Trowleze"
North American Company	"Narcoset"

### 3.0 EXECUTION:

- 3.1 Safety: The boiler shall be removed from service, cooled, drained, and purged prior to conducting internal inspection or repairs. No personnel shall enter the boiler until the atmosphere in the boiler has been checked and found to be free of toxic, explosive, or suffocating gases.
- 3.2 Closing up the Boiler: The repair shall not be covered by replaced or reinstalled materials until authorized by the pertinent authorities.

END OF SECTION 15184



## SECTION 15190

### DUCTWORK INSULATION

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of ductwork insulation. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
- 2.1 Insulation: shall be in accordance with the following:
- A. Duct insulation, as well as the adhesives and finishing facings or jackets used therewith shall have flame spread rating not over 25 without evidence of continued progressive combustion and shall have a smoke developed rating not higher than 50. Adhesives and coatings shall be fire retardant type.
  - B. Available Manufacturer's: Subject to compliance with the requirements of the plans and specs, manufacturer's products which may be incorporated in the work include, but are not limited to, the following:
    - Armstrong World Industries, Inc.
    - Babcock and Wilcox; Insulating Products Div.
    - Certain Teed Corp.
    - Knauf Fiberglass GmbH.
    - Manville Products Corp.
    - Owens-Corning Fiberglass Corp.
    - Pittsburgh Corning Corp.
    - Rubatex Corp.
- 2.2. Board Type: Fiberglass board shall be 2-inches thick unless otherwise specified, shall have 3-pound minimum density, and its thermal conductivity shall not exceed 0.23 at 75 F. mean temperature. It shall have a factory applied facing of aluminum foil reinforced with fiberglass yarn mesh and laminated to 40-pound draft paper which has been chemically treated to give it the permanent flamespread and smoke-developed characteristics required. The use of plain (unfaced) fiberglass board on ductwork serving only as heating supply ducts is also acceptable. Fiberglass board shall be used to insulate ductwork specified in (a), which is installed in work concealed spaces (hung ceilings (when the ceiling is not used as a return air plenum), furred spaces, pipe and duct spaces, crawl spaced, tunnels, etc.)
- 2.3 Flexible Type: Flexible (blanket) type fiberglass duct insulation shall be 2-inches thick unless otherwise specified, shall have 1-pound nominal density, and its thermal conductivity shall not exceed 0.29 at 75 F. mean temperature. It shall have the factory applied foil-reinforced kraft facing specified for fiberglass board. Flexible type duct insulation shall be used to insulate ductwork specified in (a),



## 15000 - Mechanical

which is installed in concealed spaces (hung ceilings, furred spaces, pipe and duct spaces, crawl spaces and tunnels).

### 2.4 Facing and Finishing:

#### A. Exposed Ducts:

1. Insulation on ductwork exposed to view in Mechanical Room, Mechanical Room Area, Rooms, Corridors, Custodian's Workshop, Equipment Room, Instructional Areas, Offices, Receiving Room, and finished spaces shall have a facing or finish as specified herein. (For the purpose of this paragraph, "finished spaces" shall be understood to mean those spaces which have plaster, tile, painted or a special coat.)
2. Insulation on ductwork not concealed shall have a glass cloth finish installed in the following manner: Brush a full coat of lagging adhesive on all surfaces of the ductwork insulation. Imbed glass cloth in the wet coating, smoothing to avoid wrinkles. Overlap cloth seams 4-inches, locating seams so as to be hidden from view, wherever practicable. Apply a second coat of lagging adhesive.

- B. Concealed Ducts: Insulation on ductwork installed within pipe and duct spaces, storerooms, hung ceilings furred spaces (when the ceiling is not used as a return air plenum), or pipe tunnels shall have no additional finishing, other than the foil-reinforced-kraft facing.

### 3.0 EXECUTION:

#### 3.1 Installation of Board Type Insulation:

- A) Insulation shall be applied with edges tightly butted . It shall be impaled on "Graham" pins welded to the duct or on stick clips, and secured with speed clips impaled over the pins. Pins shall be cut off close to speed clips. On horizontal ducts, pins shall be spaced not less than one per square foot for the bottom surface, and not less than one per two square feet on the sides and top surface. On vertical ducts, the pins shall be spaced not less than one clip per two square feet of duct surface. For faced insulation point all joints and cracks with vapor barrier coating, and seal all joints and speed clips with a 3-inch wide strip of foil-reinforced-kraft facing adhered with insulation adhesive. The use of pressure sensitive tape of the same facing material also is acceptable.
- B) Where, because of space or size restriction, the welded pin method cannot be used, the use of stick clips will be approved or the insulation shall be secured to the duct with insulation adhesive. The adhesive shall cover the entire surface of the sheet metal when applied to underside of horizontal duct, but may be applied in stripes for application to top and sides with a minimum of 50% coverage. Insulation shall be additionally secured with No. 16-gauge soft annealed galvanized steel wire on not more than 12-inch centers. Continuous metal corner angles shall be used to protect edges of the insulation.

- 3.2 Installation of Flexible Type Insulation: Flexible type insulation shall be cut slightly longer than the perimeter of the duct to insure full thickness at corners and proper overlap. Insulation shall be applied with edges tightly butted, and it shall be secured with insulation adhesive. Adhesive shall be applied so that the insulation conforms to duct surfaces uniformly and firmly. Insulation shall be additionally secured with No. 16-gauge soft annealed galvanized steel wire on not more than 12-inch centers. When the width of a horizontal duct is 48-inches or more, the insulation shall also be fastened with welded pins or stick clips spaced on 24-inch centers on the bottom surface of the duct. All joints and





## 15000 - Mechanical

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clips shall be taped and sealed with 3-inch wide strips of foil-reinforced-kraft facing applied with insulation adhesive. The use of pressure sensitive tape of the same facing material also is acceptable for this purpose.

END OF SECTION 15190



## SECTION 15320

### GREASE INTERCEPTORS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of grease interceptors. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
- 2.1 Semi-Automatic Grease Draw-Off: Unit shall be on-floor type, cast iron, porcelain, or painted inside and out, with internal air relief, grease draw-off piping, and valve with flow control fitting. Draw-off piping and nozzle may be interchanged in field to make unit a right or left-handed installation. Unit shall also have double wall trap with removable baffles and gasketed cover with low pressure chamber. The pipe size of the influent line shall be based on the influent flow rate and grease capacity.
- 2.2 Manual Grease Draw-Off: Unit shall be on-floor type, partially recessed or flush-with-floor type, cast iron, porcelain, or painted inside and out, with internal air relief and flow control fitting. Unit shall have double wall trap, removable baffles, gasketed cover bearing plumbing, and drainage seal of approval. The pipe size of the influent line shall be based on the influent flow rate and grease capacity.
- 2.3 Manual Grease Draw-Off, Coated Steel Type: Unit shall be high volume on floor or partially recessed, with internal air relief, double wall trap, removable baffles, gasketed non-skid cover, and flow control fitting. The pipe size of the influent line shall be based on the influent flow rate and grease capacity.
- 3.0 EXECUTION: The unit shall be placed in the influent line of the waste water disposal and treatment system.

END OF SECTION 15320



## SECTION 15400

## INTERIOR PLUMBING

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of interior plumbing: Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS:

2.1 General

2.1.1 Fixture Schedule: The Contractor shall submit for approval, 5 of copies of all fixtures required under the contract. The Submittal shall contain a schedule, cuts, manufacturer's plate numbers and complete descriptions of all fixtures and accessories. It shall be neatly bound in sets with the title of the building on the front cover page. After tentative approval of the schedule, samples of fittings and trimmings shall be submitted for approval, as hereinafter specified, and after these have been approved, final approval shall be issued for the schedule, with the understanding that all fixtures and accessories must meet the requirements specified regardless of approval by catalog numbers, cuts or description.

2.1.2 Where fixtures come in contact with walls or floors, the space between the fixture and wall or floor shall be sealed against water seepage with Dow Corning 786 or GE-"RTV". Color of sealant shall be white or clear.

2.1.3 Fixture Height Schedule:

A. Installation height of fixtures from rim to finished floor, except for these fixtures that are to be used by the handicapped, shall be as follows:

<u>Fixture</u>	<u>Height</u>
Water Closet	24"
Urinals - Wall Hung	24"
Lavatories	31"
Wash Sinks (with legs)	35"
(without legs)	36"
Drinking Fountain	35"
Sinks (General)	36"



## 15000 - Mechanical

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Sinks (Science Rooms) 36"

Electric Water cooler 40"

B. Installation height of fixtures for handicapped shall be as follows:

1. Water closets for handicapped shall be installed with top of seat 19 inches above finished floor.
3. Wall hung urinals shall be installed with rim 17 inches above finished floor.
4. Lavatory for Handicap.
5. Handicap lavatory.
6. Handicap Wash Center.
7. Barrier Free Wash fountains shall be installed with bottom of bowl 28 inches above finished floor.
8. Drink Fountains:
  - a. Wall mounted typed shall be installed with spout outlet no higher than 36 inches above finished floor.
  - b. Pedestal type shall be installed with rim 33 inches above ground level.
9. Electric Water Cooler shall be installed with bottom of cooler 27 inches above finished floor and spout outlet no higher than 36 inches above finished floor.
10. Combination Sink Bowl and Drinking Fountain "Type A" shall be installed with counter surface 34 inches above finished floor.

2.2 Drinking Water Dispensers:

- 2.2.1 Electric Water Coolers shall comply with ARI Standard 1010 and shall use approved CFCs. Top surfaces of the dispenser in contact with water shall be stainless steel. Piping connections from the shutoff or stop valve and outlet valve arrangement shall be chrome-plated brass.

2.3 Hot Water Generators and Storage Tanks:

- 2.3.1 Heating Element for the hot water generator shall consist of U-bend coils, a tube sheet, and air element head. The coil shall be seamless tubing inserted into holes in the tube sheet and secured by expanding. The tube sheet shall be copper alloy or other nonferrous metal. Tubing for the heating element shall be light drawn copper tubing complying with ASTM B 75 or copper alloy tubing complying with ASTM B 111, copper alloy No. 706.
- 2.3.1.1 Copper Tubing shall be designed for a working pressure of 150 psig steam and shall withstand an internal hydrostatic pressure of, 225 psig for not less than 15 seconds without leaking or any evidence of damage.
- 2.3.1.2 Copper Alloy Tubing shall be designed for a working pressure of 400 psig with 400 F hot water and shall withstand an internal hydro-static pressure of 600 psig for no less than 15 seconds without leaking or any evidence of damage.



- 2.3.1.3 The Head for the Heating Element shall be close grained cast iron or fabricated steel for steam service, or cast or fabricated steel for high temperature hot water service. The heads shall be partitioned to separate the steam supply and condensate return. The head shall be equipped with tappings or flanges for the supply, return, air relief, and vacuum breaker connections. The air-relief valve and vacuum breaker connection shall be 1/2 inch pipe size.
- 2.3.2 New Storage Tanks shall be constructed, tested, and marked in compliance with the ASME Boiler and Pressure Vessel Code, Section VIII. The tank shall be glass-lined steel. Tanks shall be cathodically protected if required by local conditions.
- 2.3.3 Storage Tank Repair shall comply with the ASME Boiler and Pressure Vessel Code, Section VIII.
- 2.4 Pneumatic Water Supply Systems:
- 2.4.1 New Pneumatic Tanks shall be designed for 125 psig working pressure and shall be constructed in compliance with ASME Boiler and Pressure Vessel Code, Section VIII. Tanks shall be equipped with manhole in head, water gauge glass, pressure gauges, water pressure relief valves, and tapped openings for all piping.
- 2.4.2 Compressor shall be belt-driven by a motor having a maximum speed of 1800 rpm. The motor shall have a manual across-the-line starter and thermal overload protection. Guards complying with OSHA requirements shall be provided for all exposed moving parts.
- 2.4.3 Control System: Pressure switches shall be of the adjustable type having an operating range of 30 to 90 psig. The switch shall be three position type.
- 2.5 Gas Fired Water Heaters:
- 2.5.1 Water Heater Storage Tank shall be steel with a copper or glass lining and shall comply with ANSI Z21.10.1. Equipment shall comply with the approval requirements of the Certified Appliances and Accessories of AGAL. For elevations above 2,000 feet, the AGAL rating shall be reduced at the rate of 4 percent for each 1,000 feet above sea level. Safety pilot valve shall be supplied to automatically shut off the main gas supply to the burner or burners in the event that the pilot flame is extinguished.
- 2.5.2 Flue Gas Piping shall be single-wall metal pipe constructed of not less than No. 24 B&S gauge sheet copper or No. 20 gauge galvanized sheet steel.
- 2.5.3 Relief Valves shall comply with ANSI Z21.22.
- 2.5.4 Thermostat shall be snap action type actuated by water temperature.
- 2.5.5 Discharge from T & PRV shall be taken, undiminished in size to the nearest safe floor drain or to daylight.
- 2.6 Oil Fired Water Heaters:
- 2.6.1 Water Heater Tank shall be glass-lined steel with dual heating elements. Tanks shall be cathodically protected if required by local conditions.
- 2.6.2 Burner shall be mechanical pressure atomizing type.
- 2.6.3 Controls shall consist of a combustion safeguard (primary control) to shut down the burner in event of ignition failure or flame failure, a limit control to prevent overheating in case of thermostat failure, and a thermostat of the adjustable immersion type to control water temperature.



## 15000 - Mechanical

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- 2.6.4 Relief Valve shall comply with ANSI Z21.22.
- 2.6.5 Draft Regulator shall be of the automatic, barometric type designed for installation in the chimney or flue connector at the outlet of the water heater. The draft regulator shall meet the requirements of UL 378.
- 2.6.6 Flue Gas Piping shall be single wall steel pipe, minimum 28 gauge. Finish shall be zinc coated or oxidized to form blue black color.
- 2.7 Electric Water Heaters:
  - 2.7.1 Water Heater Tanks shall be glass-lined steel with dual heating elements. Tanks shall be cathodically protected if required by local conditions.
  - 2.7.2 Relief Valves shall comply with ANSI Z21.22.
  - 2.7.3 Thermostats shall be provided in compliance with UL 174.
  - 2.7.4 Wiring shall comply with NFPA-No.70.
  - 2.7.5 Discharge from T & PRV shall be taken, undiminished in size to the nearest safe floor drain or to daylight.
- 2.8 Lavatories:
  - 2.8.1 Lavatories shall be first quality vitreous china or enameled cast iron.
  - 2.8.2 Drains and Jam Nuts shall be cast wrought copper alloy. Stainer shall be copper alloy or corrosion-resisting steel.
  - 2.8.3 Faucets shall be single, center set, combination, or single control mixing type.
  - 2.8.4 Stop Valves shall be angle or straight type and constructed of copper alloy, chrome plated.
  - 2.8.5 Traps shall be P-type, cast brass.
  - 2.8.6 Soap Dispensers shall be glass or metal type with a capacity of 12 fluid ounces for liquid soap when shown.
- 2.9 Urinals:
  - 2.9.1 Wall-Hung Urinals shall have integral trap and extended shield; shall have washout, blowout, or siphon-jet flushing action; and shall be constructed of first quality vitreous china.
  - 2.9.2 Pedestal Type Urinals shall have integral trap, siphon-jet flushing action, and a bottom outlet for connection to a closet type floor flange. Urinal shall be constructed of first quality vitreous china.
  - 2.9.3 Trough Type Urinals shall be wall-hung with an integral flushing rim and shall be constructed of first quality vitreous china.
- 2.10 Water Closets:
  - 2.10.1 Unless otherwise specified all water closets shall be wall hung type with chair carrier, for use with a flush valve and constructed of first quality vitreous china. Seats shall be open front, less cover, constructed of molded plastic or wood.



- 2.10.2 Unless otherwise specified, water closets on first floor and below shall be blowout type. All other water closets shall be siphon Jet 1, floor outlet type, constructed of first quality vitreous china. The tank shall be separate, secured to and supported by the water closet and shall contain a copper, copper alloy, or corrosion-resisting steel float and flush valve with a refill tube, operating lever, and control valve stop and supply pipe. Seats shall be closed front, with cover constructed of molded plastic or wood.
- 2.10.3 Fittings: Floor flanges, gaskets, bolts, and screws shall be supplied. Flanges may be copper, copper alloy, or cast iron. Gaskets shall be nonstaining wax.
- 2.11 Sinks:
- 2.11.1 Kitchen Sink shall be single or double bowl stainless steel.
- 2.11.2 Service Sink shall be single bowl, trap standard, floor or wall mounting. Sink shall be constructed of enameled cast iron or vitreous china. Rim guard shall be copper alloy or corrosion-resisting steel.
- 2.11.3 Faucets shall be a single center set or combination type. Vacuum breaker shall be provided on faucets where required by codes.
- 2.11.4 Drains shall have a removable metal strainer, jam nut, coupling, and tail piece.
- 2.11.5 Traps for kitchen sinks shall be P-type chrome-plated. Exterior surfaces of traps for service sinks shall be as cast or painted.
- 2.12 Bathtubs shall be enameled cast iron or porcelain enameled formed steel or shall be fiber-glass reinforced plastic. Drains shall be chrome-plated with pop-up or trip lever stopper.
- 2.13 Laundry Tubs:
- 2.13.1 Laundry Tubs shall be double bowl enameled cast iron or corrosion-resisting formed steel with frame, wall, pedestal, or leg support.
- 2.13.2 Faucet shall be mounted in back of tub and shall be a separate or combination fitting. Combination faucet shall have exposed valve body, union inlet, and swing spout. Finish shall be chrome or nickel plated. Vacuum breakers shall be provided on faucets where required by codes.
- 2.13.3 Drain shall have a removable metal strainer, jam nut, coupling, and tail piece. Drain shall have a suitable rubber type stopper.
- 2.13.4 Trap shall be P-type with cleanout plug and shall be cast brass.
- 2.14 Flush Valves: Flush valve shall be a large diaphragm or large piston type exposed style with a side oscillating handle. The flush valve shall have a vacuum breaker; a control stop with or without a cap; a back check in the control stop with or without a cap; a back check in the control stop or anti-siphon within the valve; a flush connection with coupling nuts, gaskets, and spud flanges; and a wall flange or escutcheon. Exposed surfaces of the flush valve shall have a bright chrome-plated finish. The valve shall be capable of operating without chatter or water hammer and shall deliver 2 gallons minimum for urinals and 4 gallons minimum for water closet per flush at any inlet pressure from 10 psi to 50 psi.
- 2.15 Showers: shall be wall mounted, column, bath, free standing cabinet, or emergency type. Shower heads and handles shall be copper alloy or corrosion-resisting steel. Escutcheons shall be corrosion-resisting steel or copper alloy. Control valves shall be copper alloy and have metal integral parts of copper alloy, nickel alloy, or corrosion-resisting steel. Control valves shall be thermostatic mixing;



## 15000 - Mechanical

pressure balancing; mechanical, either mixing or single control; or separate hot and cold water valves. Shower heads shall be nonadjustable. Other types as directed by the Contracting Officer.

### 2.16 Floor Drains:

- 2.16.1 Cast-Iron Drains shall comply with ANSA A112.21.1, Body shall be cast iron with integral "P" trap when called for and strainer shall be chrome-plated bronze or nickeloy.
- 2.16.2 Polyethylene Drains shall be constructed of polyethylene complying with ASTM D 1248.
- 2.16.3 Gaskets shall be neoprene complying with ASTM C 564 or as recommended by the drain manufacturer.

### 2.17 Drain Types:

1. Type A: (Toilet Room/Shower stall drains) shall be cast iron with double drainage flange and seepage openings, bottom outlet connection, flashing clamp device, and 6" round adjustable strainer of high polished brass or bronze. Individual shower compartments use a 6" round adjustable strainer of high polished nickel bronze. Drains shall be Smith 2010-A, Zurn Z-415-ZB or Wade W-1100.
2. Type B: (Kitchen Indirect Waste Clear Water) shall be Jay R. Smith 2360-NB-12-ARC(I&O) or Zurn ZN-526-76-AR. Drain shall be cast-iron with acid resistant coated interior and exterior, bottom outlet, flashing collar, adjustable nickel bronze top and 1/2 bar grate with sediment bucket.
3. Type C: (Kitchen Floor Drain) shall be Jay R. Smith 2360-NB-ARC(I&O) or Zurn Z- 526-77-AR. Drain shall be cast-iron with acid resistant coated interior and exterior, bottom outlet, flashing collar, adjustable nickel bronze top and full bar grate with sediment bucket.
4. Type D: (Kitchen Indirect Waste Clear Water) shall be cast iron with double drainage flange and seepage openings, bottom outlet connection and 7" diameter adjustable strainer with sediment bucket of high polished brass or bronze. Drain shall be Smith 3510-F37, Zurn Z-415-ZB or Wade-1100-ER7.
5. Type E: Custodian Mop Sink shall be cast iron body drain with bottom outlet connection, flashing flange with seepage openings and clamping device, cast aluminum or brass, removable sediment bucket and polished brass or bronze top and grate. For assembled bucket use stainless steel bolts and nuts peened after assembly. Strainer plate shall not be secured to body as required for other drains. Drain shall be Smith 2488 or Zurn ZB-767-77. Provide over drain an approved rigid type combination faucet 4'-0" above the floor. The faucet shall be a 1/2" supply fitting equipped with integral vacuum breaker, integral stops, renewable seats and heavy cast brass spout braced to wall with rigid support. Faucet shall be Speakman S-5811, T&S Brass and Bronze works, Inc. B-1958, or Water Saver Faucet VR-769. Faucet shall have a hose thread and shall be furnished with a four foot length of 4-ply rubber hose connected to hose end of faucet.
6. Type F: (Acid Drain) shall be silicon iron with flashing ring, double drainage, bottom outlet and shall be Duriron Plate No.5501-ACF.
7. Type G: (Membrane Waterproof Floor) shall be cast iron with bottom outlet connection, double drainage flange with drainage openings, removable cast iron sediment bucket with perimeter





- drainage slots, loose set polished bronze grate so designed that grate cannot be set unless bucket is in position. Drain shall be Smith 2220, Zurn Z-554-ZB-VP or Wade W-1310-TD.
8. Type H: (Adjustable Type) shall be cast iron with bottom outlet connection, double drainage flange and drainage openings, adjustable collar with rolled thread of alignment tract and locking screws, removable sediment bucket and polished bronze grate so designed that grate cannot be set unless bucket is in position. Drain shall be Smith 2350, Zurn ZB-520-ZB-VP-Y or Wade 1340-TD,
  9. Type J: (Boiler Room, Mechanical Spaces, Meter Rooms) shall be cast iron, triple drainage, bottom outlet caulk connection, medium duty round grate and slotted sediment bucket with 1/4" bottom drainage openings, so designed that grate cannot be set unless bucket is in position. Drains shall be Smith 2230, Zurn Z-540-Z-VP or Wade W-1210-TD.
  10. Type K: (Boiler Room, Mechanical Spaces, Meter Rooms) shall be cast iron, triple drainage side outlet caulk connection, medium duty round grate and slotted sediment bucket with 1/4" bottom drainage openings, so designed that grate cannot be set unless bucket is in position. Drains shall be Smith 2235, Zurn Z-540-83 or Wade W-1230-TD.
  11. Type L: (Exterior Areas, Parking Areas, Playgrounds) shall be cast iron drainage with double drainage flange and seepage openings, bottom outlet caulk connection, heavy duty round grate and slotted sediment bucket with auxiliary drainage rim and 1/4" bottom seepage openings, so designed that grate cannot be set unless bucket is in position. Drain shall be furnished with vandalproof locking device consisting of angle latches, 3/8" x 7/8" minimum stainless steel locking bar drilled and tapped to receive 3/8" stainless steel screw with spanner type stainless steel cap set flush with top of grate. Under side of grate shall be provided with recess to receive a boss cast into sediment bucket or other locking device to prevent grate from turning in bucket. Drains shall be Smith 2253-U-2, Zurn Z-543-81 or Wade W-1710-A-NY.
  12. Type M: (Exterior Areas, Parking Areas, Playgrounds) shall be cast iron triple drainage with double drainage flange and seepage openings, side outlet caulk connection, heavy duty grate and slotted sediment bucket with auxiliary drainage rim and 1/4" bottom seepage openings, so designed that grate cannot be set unless bucket is in position. Drain shall be furnished with vandalproof locking device consisting of angle latches, 3/8" x 7/8" minimum stainless steel locking bar drilled and tapped to receive 3/8" stainless steel screw with spanner type stainless steel cap set flush with top of grate. Under side of grate shall be provide with recess to receive a boll cast into sediment bucket or other locking device to prevent grate from turning in bucket. Drains shall be Smith 2255-U-2, Zurn Z-543-82 or Wade W-1710-MS-NY.
  13. Type N: (Exterior Areas Walks, areaways etc.) shall be cast iron, double drainage, bottom outlet caulk connection, heavy duty tractor grate and slotted sediment bucket with 1/4" bottom seepage openings, so designed that grate cannot be set unless bucket is in position. Each drain shall be furnished with a vandalproof locking device as described for "Type L" drain. Drain shall be Smith 2233-U-2, Zurn Z-541-Z-VP or Wade W-1210-TD-NY.
  14. Type O: ((Exterior Areas Walks, areaways etc.) shall be cast iron, double drainage, side outlet caulk connection, heavy duty tractor grate and slotted sediment bucket with 1/4" bottom seepage openings, so designed that grate cannot be set unless bucket is in position. Each drain shall e furnished with a vandalproof locking device as described for "Type L" drain. Drain shall be Smith 2238-U-2, Zurn Z-541-97 or Wade W-1230-TD-NY.



## 15000 - Mechanical

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15. Type P: (Ramp drain, small trench drain) shall be galvanized cast iron body and flange, bottom outlet caulk connection with dome strainer with end plates and gasket. Grates shall be furnished with openings not more than 1/2" square. Grates to be installed with vandal proof screws. Length of drain shall be as shown on Drawings. Drain shall be Smith 2885-F-G-C-U-DBS.

15. Type R: (Kitchen sanitary drain; indirect drain below kitchen sinks).

Drain shall be cast iron flanged receptor with acid resistant coated interior with aluminum dome bottom strainer less rim and grate. Drain shall be Smith 3161-10 or Zurn ZN-1902-ZN-HS-23.

### 3.0 EXUCUTION:

3.1 Installation of new equipment and repair of existing equipment shall comply with N4VHCC National Standard Plumbing Code and local plumbing governing codes.

3.2 Repair of the Pneumatic Pressure Tank shall comply with ASME - Boiler and Pressure Vessel Code, Section VIII.

3.3 Testing of Repaired Tanks: After repairs have been completed, hot water generator storage tanks and pneumatic pressure tanks shall be tested in compliance with ASME Boiler and Pressure Vessel Code, Section VIII.

3.4 Flue Gas Piping: New flue gas piping shall be installed in compliance with NFPA No. 211. New flue gas vent piping shall be in- stalled in compliance with NFPA No. 54

3.5 Faucet Repair shall be limited to replacement of washers, renewable seats, or broken handles.

3.6 Air Chambers for prevention of water hammer shall be checked to see if they are waterlogged if possible.

END OF SECTION 15400



## SECTION 15470

### POOL EQUIPMENT

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of pool equipment. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
  - 2.1 Electric Swimming Pool Heaters shall be UL listed and shall conform, to the ASME Boiler and Pressure Vessel Code. The heating elements shall be constructed of copper and shall be pre-wired with the connection at the element terminal sealed against moisture. Controls shall include a differential thermostat and a high temperature limit manual reset switch.
  - 2.2 Gas-Fired Swimming Pool Heaters shall conform to the ASME Code and shall be approved by the American Gas Association. Heat exchangers shall be two- or four-pass design with copper-finned tubes. The burner shall be constructed Of stainless steel and shall be provided with all necessary valving to meet ASME Code requirements.
  - 2.3 Diatomite Filtration System shall consist of a centrifugal circulating pump, plastic filter elements surrounded by diatomaceous earth coating, a dry chemical feeder for feeding diatomaceous earth, and a modulating levels control valve for the filter inlet line.
    - 2.3.1 Filtering Beds:
      - A. New filtering beds, in each of the filters, shall be compose of anthracite and/or anthracite materials, washed, graded and installed as follows:
      - B. First layer (bottom) 8 inches 13/16" x 1 5/8", Sizes #6.  
Second layer 5 inches 5/16" x 9/16", Sizes #4.  
Third layer 2 inches 3/32" x 3/16", Sizes #2.  
Fourth layer (top) 27 inches of effective size approximately .70 M.M. and a uniformity coefficient less than 1.6.
      - C. All layers shall be installed perfectly level. Samples of the aforementioned materials shall be submitted for approval before proceeding with any of the herein before specified work.
      - D. The filtering materials shall be delivered to the job sites in separate sealed and tagged containers and shall be placed directly into filters from the containers.
      - E. The charging of the filters shall be done in the presence of an inspector for the Contracting Officer.
    - 2.3.2 Relief Valves at Filters: Shall be 3/4 inch automatic air relief valves similar and equal to American Water Softener Co., Model Marsh No. 50, installed in top of a tee fitting at top of filter heads. Extend



## 15000 - Mechanical

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from tee fitting with 1/2 inch pipe to within 6 inches of floor. Install in 1/2 inch pipe a globe valve at 5'-0" above floor for manual air relief.

### 2.3.3 Chemical Feeder Pump Unit:

- A. Chemical feed pump shall be of the positive displacement diaphragm type in which the chemical solution may be drawn from either tank and forced into the pool circulation pipe at the fitting provided through foot valve, plastic or chemical resistant solution hose, pump check valve, injector and nozzles to operate against a pressure of 85 P.S.I.
- B. Diaphragm assembly shall be preformed to a special shape and reinforced to insure freedom from strain and to insure accuracy of measurement under all operating conditions.
- C. The pump shall be equipped with threaded valve type air vent for the purpose of priming and eliminating air without stopping the pump.
- D. All parts which come in contact with the chemical solution shall be chemically resistant plastic or hard rubber. The pump and valve assemblies shall be removable for easy cleaning or replacement.
- E. Provide sight glass or transparent pumping head so that operation may be checked at a glance.
- F. Feeding rate shall be adjustable from 4 to 68 gallons per 24 hours while unit is operating.
- G. Pump shall have oil bath lubrication. All rotating shafts shall have roller or ball bearings.
- H. Motor drive shall be standard fractional horsepower motor of size recommended by the feeder manufacturer, of 115 volt, 60 cycle AC
- I. Unit shall be provided with outlet box for rigid conduit wiring (plug-in not acceptable).
- J. Chemical feeder shall be Wallace and Tiernan Model A-747P(Simplex), A-748P (duplex), B.I.F. Div. of NY Air Brake Co., Model 1210-04 (simplex), 1210-05 (duplex) or approved equal.
- K. Provide a labeled package of spare parts as follows:
  - 1 complete set of gaskets
  - 1 diaphragm assembly
  - 2 poppet valve seats
  - For B.I.F. Feeder provide:
    - 1 Reagent Diaphragm
    - 2 check valves
    - 3 washers

### 2.3.4 Cement Lining: Filter tanks shall be cement lined in accordance with the Standard Specifications, Sections Tanks.

### 2.3.5 Pool Circulating Pump:

- A. Shall be end suction close coupled to a 3 phase, 208 volt, 60 cycle, 1750 RPM drip proof motor. Casing shall be extra heavy cast iron, impellers shall be enclosed, single piece, cast bronze.



Pumps shall be capable of circulating the entire contents of the pool within an eight (8) hour period, against a minimum of a 50 foot head.

B. Pump shall not overload when emptying the pool, with a head varying from 9 to 20 feet.

2.4 Swimming Pool Chlorinators shall be the gaseous chlorine cylinder-mounted type. Materials for construction of chlorinators shall be in accordance with recommendations of the Chlorine Institute.

2.4.1 Solution Containers:

A. Container shall be of polyethylene, with open top, cover, steel overpack, with approximate capacity of 55 gallons and approximate size of 22 inches O.D. by 32 inches high.

B. Each container shall be provided with a tapped outlet, near bottom, with plug for draining.

C. Each container shall be mounted on a circular metal stand constructed of 1 1/2-inch angle iron formed to suit the diameter of tank and provided with 1 1/2-inch angle iron legs (four) welded to the circular angle, stand shall be of height to raise tank to a height of 8 inches above floor.

D. Overpack shall be painted with one coat of zinc chromate primer paint and two coats of oil paint of grey color. Stencil on the exterior of overpack, in letters three inches high, the words "CHLORINE", "ALUM", or "SODA-ASH", as required.

E. Solution containers shall be as manufactured by Wallace and Tiernan, B.I.F., or approved.

2.4.2 Water Supply for Chemical Solution Tanks:

A. Connect to nearest domestic cold water supply pipe and extend therefrom with 1/2 inch brass piping and drop at the soda and alum tanks and terminate at a height of 6 inches above the soda and alum tanks with a 1/2 inch swing spout single faucet (compression) with a spout of sufficient length to reach the two tanks.

B. Support the pipe to column or wall at two points in the vertical section with solid ring hangers and 1/4 inch expansion bolts.

C. Provide a gate valve at connection to domestic supply.

2.4.3 Make-Up Tank:

A. Shall be 5/16 inch welded steel construction continuously welded and provided with the required welded flanges, braces and brackets for pipe supports, etc.

B. Provide a new full size bronze or brass float valve, copper rod and copper ball float as per No. 8400 of Kieley and Mueller Inc., "Ford" No. 10 or "Schade" No. 7.

C. The entire insides of the tank shall receive two coats of non-toxic protective material, designed for potable water tank use, the equal of Dampney Co. of American Apexior #3, Koppers Coke Co. "Bitumastic Tank Solution", Pittsburgh Coke and Chemical Co. #104. Coating shall be applied and tank flushed clean, in accordance with manufacturer's recommendations.

D. Paint the entire outside of tank, supports and beams with one coat of zinc chromate primer paint and one coat of grey oil paint.



## 15000 - Mechanical

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- 2.5 Swimming Pool Surge Tank System shall include a surge tank, a vertical pump, and an electronic float switch. The surge tank shall be in compliance with ASME Code requirements for Unfired Pressure Vessels.
- 2.5.1 Flow Meter:
- A. Install in pool recirculating piping, after filters, a ratameter which shall indicate the rate of flow of water in gallons per minute.
  - B. Meter shall be 1/2 inch, with by-pass piping, glass tube type, 10 inch scale, fixed orifices and complete with main line orifice and companion flanges.
  - C. Rate of flow shall be based on capacity of pool circulating pump in G.P.M.
  - D. Size of main line pipe, main line orifice differential and range shall be calculated by the Contractor and 3 copies submitted to the Contracting Officer for approval.
  - E. Flow meter shall be Wallace and Tiernan Vareameter, or approved equal.
- 2.6 Pool Drains shall be constructed of cast iron.
- 2.6.1 Strainers(simplex):
- A. Shall be rated at 50 PSI working pressure, flanged cast iron, basket-type strainers.
  - B. Strainers shall have easy to open yoke type cover and perforated 5/32" nominal (actual 0.150) service stainless steel strainer basket with free area equal to at least four times the cross sectional basket 1/8" petcock in cover. Furnish one spare stainless steel basket.
  - C. Strainers shall be as manufactured by Neptune Benson or approved equal.
- 3.0 EXECUTION:
- 3.1 Personnel shall not begin repairs on the electric swimming pool heater until power to the heater has been disconnected.
- 3.2 Chlorine Gas storage and use shall be in accordance with recommendations of the Chlorine Institute Manual.
- 3.3 Recharging of Filters - Removals:
- A. Removals - Remove the entire filtering materials and including piping manifolds, laterals and strainers from each filter tank. Remove the cement bottoms down to the inner surface. The entire interior surface of each filter tank shall be scraped and cleaned with a wire brush.
  - B. Debris - All filtering materials , manifolds and laterals, etc., removed from filter tanks shall be immediately removed from the premises.
- 3.4 Recharging of Filters - Installations:
- A. Install Schedule 80 PVC piping including supports and nipples as manufactured by G and R Sloane Manufacturing Co. or approved equal. PVC laterals must be welded to the header with PVC filter rod.
  - B. Manifolds shall be made up of 4-inch pipe and fittings to receive the new laterals and air relief valves. The manifolds shall extend the diameter of the filters, and fitted with caps at the ends



and fibre bushings where the same enter the shell flanges. The manifolds shall be fitted at the top side with new air relief valves, one at each end, for venting air from the manifolds and laterals. The laterals shall be made up of 1-1/4 inch pipe attached to the manifolds 6 inches on centers; laterals shall extend to within 2 inches of the shell of the filters and be fitted with caps at the ends. The laterals shall have 1/2 inch diameter perforations at the underside drilled 6 inches on centers for the collection of filtered water and the distribution of wash water over the entire area of filter beds.

- C. The entire area of the bottom of the filters shall be surfaced with the cement mortar, composed of one part Portland cement and two parts clean sharp sand, applied in even plane to within 1-1/2 inch of the bottoms of the laterals. Each lateral shall be supported on a hanger and 1/4-inch PVC nipple set into the cement base.

- D. The top supply, inside each filter, shall be modified and installed, as follows:

In lieu of the top supply piping turning down and deflecting the water off the baffle plate; the top supply shall extend to the center of the filter and shall turn up (90° elbow) and terminate (approximately) four (4) inches from the inside head of the filter.

3.5 Supervision and Instruction:

- A. A fully trained and competent factory representative shall supervise the installation of the chemical feeder and upon completion shall instruct the Contracting Officer in the proper use, disassembly and repair of the unit together with conducting a trial run to determine the proper solutions of chemicals to be used in this pool.
- B. The pump shall be guaranteed to be free from defects in workmanship and materials and any part proving to be defective within one year after installation shall be replaced by the manufacturer at no cost to the Contracting Officer

3.6 Color Code: Pool piping system shall be color coded with identification bands, approximately 2 inches wide, space every five feet, in accordance with the following color chart:

potable (fresh) water lines - green  
recirculating water lines - blue  
backwash water lines - gray  
chlorine lines - yellow

3.7 Tests:

- A. After all the herein before work has been completed, the water shall be turned on into the filters and the filters thoroughly back-washed in the presence of the Contracting Officer inspector; the properly chemically treated and filtered water shall be bright, clear and free from suspended matter visible to the unaided eye after passing through the filters.
- B. Not more than one filter shall be shut down and overhauled at one time; arrangement shall be made with the staff in charge of the building in order to keep the pool in service at all times during the progress of the work.



## 15000 - Mechanical

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- C. All sections of ventilating ducts of other equipment which interfere in any way with the recharging or removal and installation of the filters, shall be taken down and shall be reset and connected after all filter work has been tested and accepted.

END OF SECTION 15470





## SECTION 15500

### FIRE PROTECTION SYSTEMS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of fire protection systems. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
- 2.1 Fire Protection System Materials and Components shall be Underwriters' Laboratories (UL) listed and/or Factory Mutual System (FM) approved for their intended use in accordance with all applicable Building Code.
- 2.2 Test Reports shall be submitted for all tests required by referenced publications applicable to the particular materials and components furnished for use in the work.
- 2.3 Fire Standpipe System:
- 2.3.1 Fire Standpipe System: Approved Manufacturers
- The equipment shall be manufactured by W.D. Allen Manufacturing, Division of J.W Moon, Inc.; Croker Fire Prevention, Division of Fire End and Croker Corp.; Elkhart Brass Manufacturing Co., Inc.; or approved equal. Shop drawings must be submitted and approved before installation.
- 2.3.2 All pipe for work of this Section shall be black standard steel pipe. See section 15060. The name of the manufacturer and the pressure to which the pipe was tested shall be permanently and legibly indicated on all pipe used in standpipe systems. Fittings for work of this Section shall be 350 P.S.I., black treaded malleable cast iron or flanged cast steel. Pressure ratings shall be cast in or on the fittings.
- 2.3.3 Check valves shall be flanged cast iron body, bronze mounted swing-type, 175 P.S.I. WWP, Stockham G-940, NIBCO F-908-W, or approved equal.
- 2.3.4 Control Valves
- A. Riser control valves shall be O.S. & Y. gate valves with flanged cast iron body, bronze mounted, 175 P.S.I. WWP, Stockham G-634, NIBCO f-607-0, or approved equal. They shall be sealed open by means of heavy chain and approved type heavy number locks. Control valve location shall be clearly indicated with necessary signs and arrows.
- B. Each control valve shall be marked with the number assigned to it on the riser diagram for the stand pipe system. The marking shall be in white figures, 1 1/2 inches high, on a metal disk that is at least 3 inches in diameter with a red background. The metal disc shall be securely attached to the valve.
- 2.3.5 Siamese Connections:



## 15000 - Mechanical

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- A. Flush Type: When indicated on plans, Siamese connections shall be 3" x 3" x 5" polished brass flush wall type, with escutcheon plate lettered "Standpipe", two individual drop clapper valves and cast iron plugs painted red with brass chain. Siamese body is roughed in during construction. Escutcheon and nipple assemblies are installed after construction. Siamese connection shall be W.D. Allen Co. No. 276, or approved equal. Threads to Fire Department Specifications.
- B. Exposed Type: When indicated on plans, Siamese connections shall be 3" x 3" x 5" polished brass exposed type with escutcheon plate lettered "Standpipe", two individual drop clapper valves and cast iron plugs painted red with brass chain. Siamese connections shall be W.D. Allen Co., No. 270, or approved equal. Thread to Fire Department specifications.
- C. Siamese connections shall be placed not less than eighteen inches nor more than thirty-six inches above the level of the adjoining ground or sidewalk.
- D. Each Siamese connection shall be provided with a check valve located inside the building in a horizontal section of the pipe lines in a location as directed by the Contracting Officer.
- E. An automatic ball drip for 3/4" pipe shall be installed between the Siamese connection and the check valve as indicated to properly drain system to prevent freezing. Automatic ball drip shall be W.D. Allen No. 2112 NY, or approved equal.
- F. Where a fence encloses a portion of the building containing a Fire Department connection, this Contractor shall furnish and secure to the fence directly opposite the siamese connection a steel sign containing the following wording: "F.D. Siamese Sprinkler Connection Located...Feet Behind Sign." Sign shall be finished in porcelain enamel with one-inch red letters on white background.

### 2.3.6 Roof Manifold:

Roof manifold shall be cast brass, three-way horizontal type of size indicated on plans, W.D. Allen Co., No. 439, or approved equal. Roof manifold shall be fitted with three cast brass valves equal to W.D. Allen Co., No 170U 21/2, with caps and chains and with red enameled wheel handles. Threads to Fire Department Specifications.

### 2.3.7 Fire Department Hose Valve and Cabinet:

- A. Cabinet shall be recessed type, 16 gauge steel body and trim, baked white enamel inside. Exposed trim shall be stainless steel 18-8, Type 302, with a No. 4 finish. Cabinet doors shall be gauge stainless steel (finish to match cabinet trim), duo-panel wire inserted clear glass. Door shall be hinged right or left. Cabinet No. 280 Style "L" and door No. DW shall be as manufactured by W.D. Allen Co.
- B. Hose valve shall be a 2 1/2" angle valve, cast brass body, complete with red enameled wheel handle, with red enameled finish caps and chain. Valve shall be no. 170U and caps shall be No. 120. Provide escutcheon plate No. 7120 for valve. All numbers are of those manufactured by W.D. Allen Co.
  - 1. Hose valves shall be located not less than 5'-0" nor more than 6'-0" above the floor or stair landing and shall bear the manufacturer's name.



Note: The equipment specified for the Fire Department Hose Valve and Cabinet in paragraph 2.3.7 shall be one manufacturer for each complete unit. The manufacturer's figure numbers referred to are for purpose of type only. Other approved manufacturers are listed in paragraph 2.3.1 of this Section.

### 2.3.8 Temporary Standpipe System:

Furnish, install, and maintain a temporary standpipe system during construction of any structure for which a standpipe system is required. Temporary standpipe system shall be for use by the Fire Department and shall be in accordance with the provisions of applicable Building Code.

### 2.3.9 Scheduling Interruptions and Coordination: At least 48 hours before commencing work on any specific system, the Contractor shall notify the Contracting Officer of all interruptions, if any, that must be made to the system and the estimated period of time the system will be out of service during each interruption. Interruptions shall be made only at the time or times approved by the Contracting Officer. Equipment and standby systems shall be provided for building protection during interruption to the existing systems.

### 2.3.10 Tests: All field tests required by applicable standards shall be performed in the presence of the Contracting Officer.

## 2.4 Sprinkler Work:

### 2.4.1 General

- A. Furnish and install in certain spaces of the building, as directed by the Contracting Officer, a wet pipe closed circuit automatic sprinkler system, supplied from the water main of the building. It shall be complete in every detail and shall comply with the requirements of the applicable Building Code, and with the rules and regulations of all other public authorities having jurisdiction
- B. This Contractor shall furnish and install all materials, parts, labor, etc. necessary to make a complete, properly working installation, and shall furnish all of the apparatus for a complete, electrically operated sprinkler alarm system. The materials and equipment shall be of the type and size approved by the Contracting Officer and installed in strict conformity with the applicable Building Codes. Materials and components to be underwriters laboratories (UL) and/or factory mutual system (FM) approved.

### 2.4.2 Sprinkler Heads:

- A. Automatic sprinkler heads shall be of spray type and shall be installed at proper positions as required. Pendant and upright sprinkler heads shall have deflectors to distribute the water laterally and downward in a wide pattern, approximating a half sphere. Where required sprinkler heads to be installed in areas having hung ceilings, the sprinkler heads shall be of the flush or recessed type. Nipples and sleeves shall be used where pipes pass through walls. Sprinkler heads shall be 1/2-inch size, unless otherwise shown on drawings and shall be approved type 165° F heads. Sprinkler piping, heads, etc. shall be installed so as to clear electric lighting fixtures.
- B. Sprinkler Kit



## 15000 - Mechanical

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Furnish a sprinkler kit consisting of a steel cabinet, spare sprinkler heads and a special sprinkler wrench. Six (6) spare sprinkler heads shall be provided when fewer than 300 heads are installed. Twelve (12) spare heads shall be provided for sprinkling systems containing between 300 and 1200 heads. Kit shall be delivered to the Contracting Officer.

### 2.4.3 Sprinkler Alarm Valve, Waterflow Detector, Etc.

#### A. Alarm Valve

When required, furnish and install in the supply lines, the alarm check valves indicated, which shall be Globe, Grimes, Grinnell Co., Reliable Automatic sprinkler Co., Star Sprinkler Corp. or other approved equal and of the latest approved type. Alarm valves shall be complete with all necessary attachment required to give an approved alarm signal, closed circuit accessories and terminals ready for connection to the sprinkler alarm system, and shall be complete with pressure gauges, drain valves, etc. This Contractor shall submit shop drawings of alarm valves for approval by the Contracting Officer.

#### B. Waterflow Detector

When required furnish and install a paddle type sprinkler waterflow detector in the sprinkler supply piping in the location indicated. Detector shall be equipped with a pneumatic retard device to prevent false alarms due to water surges. Paddle type waterflow detector shall be approved by the Contracting Officer, and shall be the equal of Acme Fire alarm Co. Type 430 or Reliable Automatic Sprinkler Co. Model A.

#### C. Work By Others

The sprinkler electric alarm equipment including the control panel, bells, wiring, etc., will be furnished and installed by the Contractor for Electric work. All equipment for the Sprinkler Alarm system which is not specifically called for to be furnished by others, shall be furnished by this Contractor.

### 2.4.4 Sprinkler Drains:

Furnish and install at the alarm valve, a valved drain connection, which shall be carried down to the floor to discharge into the nearest floor drain, unless otherwise directed. Low points of sprinkler piping that cannot be drained through the alarm valve drain or when there is no alarm valve, shall also be provided with drains as required.

### 2.4.5 Sprinkler Pressure Gauges:

Furnish and install approved type and make pressure gauges. Gauges shall be complete with non-ferrous metal rings, cocks, drains, etc.

### 2.4.6 Fire Department Connections:

- A. When required, furnish and install flush type siamese connections, complete with necessary check valves, drips, sensible caps, etc. Check valves shall be iron body with bronze clappers and seats. Caps shall be of galvanized iron and shall be finished in green enamel. Provide and deliver to the Contracting Officer two spare sensible caps for each siamese connections. Siamese Fittings shall be of polished heavy cast brass or cast bronze with heavy cast brass or cast bronze plate. Plate shall be inscribed "AUTOMATIC SPRINKLER" and "PART SPRINKLERED". The latter inscription shall be either an integral part of the plate or on a



separate name plate securely fastened to or above the siamese connection. Where Sidewalk siamese connections locations shall be to match the existing or as directed by the Contracting Officer, the riser pipe shall be red brass.

- B. Where a fence encloses a portion of the building containing a Fire Department connection, the Contractor shall furnish and secure to the fence directly opposite the siamese connection a steel sign containing the following working: "F.D. Siamese Sprinkler Connection Located      Feet Behind Sign. Sign shall be finished in porcelain enamel with one-inch red letters on white background.

### 2.4.7 Testing and Approval of Sprinkler System

- A. All necessary permits for work in connection with the installation of the sprinkler system shall be obtained by this Contractor before commencing any of the sprinkler work. the Contracting Officer will prepare plans, submit plans and obtain approval of the sprinkler system.
- B. This Contractor shall test the entire sprinkler installation, including sprinkler alarm system, in accordance with the requirements of the Building Code and shall give at least 2 days' advance notice in writing of tests and inspections to the Contracting Officer. Test shall be conducted in the presence of the appropriate Fire Department official or his authorized representative, and in the presence of representatives of the Contracting Officer, Fire Department and any other public authority having jurisdiction. All tests shall be performed as part of this Contract.
- C. Sprinkler system shall be subjected to a hydrostatic pressure test for a period of one hour at a pressure of at least 100 psig at the topmost sprinkler head, and at least 200 psig at the lowest cross connection to the siamese connections. The contractor shall furnish all instruments, tools and labor required to conduct the test. He shall make any alterations to the sprinkler system required to obtain approval by the public authorities having jurisdiction.
- D. Submit shop drawings of sprinkler heads, alarm valve, and waterflow detector for approval.

### 2.4.8 Ladders

Furnish and install permanent heavy steel ladders to provide access to valves, in accordance with the code requirements. Ladders shall be of width and height required, shall be made of heavy steel bars and heavy rungs and shall be permanently fastened at location. Where the shut-off valve adjacent to the sprinkler alarm valve is located higher than 6-feet above the floor, a ladder shall be provided and installed where directed.

### 2.4.9 Sprinkler Valve Tags

Each valve in the sprinkler system shall be tagged in accordance with the requirements of the applicable Building Code.

### 2.4.10 Painting of Sprinkler Piping

Exposed sprinkler piping shall be painted with a priming coat and then with two (2) coats of oil base paint of color as directed. Sprinkler heads shall be protected during painting with small paper bags. Painting of sprinkler piping, hangers, etc., shall conform with all local code requirements.

END OF SECTION 15000



## SECTION 15605

### FUEL HANDLING SYSTEMS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of fuel handling systems. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
  - 2.1 Fuel Handling System Components consisting of pump and heater set, transfer pump set, oil fill and vent terminal, suction bell and stub electric heater.
  - 2.2 Fuel Unloading Hose shall be in compliance with applicable requirements of UL 180, 330, 536, and 569 and of ANSI/ASAE B31.3.
  - 2.3 Gasoline Dispensing Pumps shall be in compliance with applicable requirements of UL 79 and 87. Submersible, 3/4 H.P. 208-230V equal to Red Jacket, Tokheim, Gilbarco.
  - 2.4 Oil/Water Separators shall be of the coalescing type, with coalescing media as required for the application. Separators shall be repaired or constructed in compliance with Section VIII of the ASME Boiler and Pressure Vessel Code.
  - 2.5 Furnish and install cylindrical fuel oil storage tanks of dimensions to match the existing or as directed by the Contracting Officer. Each tank shall be fabricated of Class "A" steel plates made by the open hearth or basic oxygen process. The plates shall be free from physical imperfections, such as laminations, cracks, mill scale, etc. Steel must be new, in good condition, and free from rust. Tanks shall be welded throughout, and shall conform with the requirements of the applicable building codes. Tanks shall be delivered to the site as soon as job conditions permit, in order to prevent delay in construction and in furnishing temporary heat. Submit shop drawings for approval.
  - 2.6 Each fuel oil tank fill terminal shall be fitted with a watertight fill box, approved by the Contracting Officer. Each fuel oil tank vent terminal shall be fitted with a DOE approved hood. Fill box and vent hood shall each be identified, by and approved permanent marking, with the tank number to which it is connected.
  - 2.7 An affidavit in duplicate, stating that the thickness of steel, inside and outside welding, and painting of tanks fully comply with the specified requirements, shall be obtained from the manufacturer and submitted the Contracting Officer before tanks are shipped from factory.
- 3.0 EXECUTION:
  - 3.1 Repair and Replacement: Work shall be performed in compliance with applicable requirements of NFPA 30, NFPA 70, and the ASAE Code.
  - 3.2 Welding shall be performed in accordance with ANSI B31.3 and ASTM Code Section IX.



## 15000 - Mechanical

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- 3.2.1 Welding for tanks shall be done by competent welders in a first-class manner. Lapped seams shall be not less than 2-inches and shall be continuously welded inside and outside. Nozzles for manholes and outlets for pipe connections shall also be continuously welded inside and outside.
- 3.3 Flushing: Repaired or replaced systems shall be flushed with the same type of fuel intended for use in the system until the outflowing fuel is free of sediment and emulsion and does not appear cloudy or hazy.
- 3.4 Each tank shall be hydrostatically tested at a pressure of 50 pounds per square inch for a period of at least 30-minutes without loss in pressure. Tests shall be made in the presence of authorized representatives of the Contracting Officer. In the event of leakage, tanks shall be made tight as approved and the test repeated.

END OF SECTION 15605



## SECTION 15620

### HIGH TEMPERATURE WATER BOILERS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of high temperature water boilers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work..
- 2.0 PRODUCTS:
  - 2.1 Contractor shall comply with Corpus Christi Army Depot regulations concerning the installation of the boilers, and shall file with that department all required information before starting the boiler installation.
  - 2.2 Boilers shall have been approved by the Corpus Christi Army Depot.
  - 2.3 Boilers and specified trim shall be constructed in strict accordance with the ASME Boiler and Pressure Vessel Code and its Agenda in effect at the time of bid, and with the requirements of any other public authorities having jurisdiction. Boilers shall be not less than the rating shown on the drawings, and the height shall fit the space available, leaving ample allowance for drawing tubes, smoke connections, piping, etc. No dampers shall be furnished for the boilers.
  - 2.4 Furnace volume of each boiler(above the floor refractory) shall not be less than SBI minimum requirement for mechanical draft operation.
  - 2.5 All materials used in the fabrication of the boilers shall be manufactured in the United States.
  - 2.6 Contractor shall submit to the with the shop drawings an affidavit from the boiler manufacturer stating that all materials used in the fabrication of the boiler have been manufactured in the United States. In addition, before delivering the boiler, he shall furnish a copy of the manufacturer's purchase orders for the tubes, sheets, etc. used in its manufacture.
  - 2.7 Shop Drawings: Contractor shall submit to the Contracting Officer for approval complete shop drawings and specifications of the boilers, showing all dimensions, plate thickness, method of staying, staybolt layout supports, outlets, manholes, refractory, and other essential details. The affidavit specified in paragraph 2-6 shall be included with the shop drawings.
  - 2.8 Approved Makes: Boilers manufactured by Burnham Corp., Federal Boiler Co., or Dewanee Boiler Corp., or Cleaver Brooks or approved equal, built in strict accordance with the specifications, drawings and job conditions, will be approved.
- 3.0 EXECUTION:
  - 3.1 Personnel shall not enter the boiler until it has been removed from service, cooled, drained, and purged.





## 15000 - Mechanical

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- 3.2 Repair and Maintenance Work shall be performed in compliance with requirements of the ASME Boiler and Pressure Vessel Code and the NBBI National Board Inspection Code, and approved by the Contracting Officer.
- 3.3 Tubes shall be replaced as specified in NBBI NB-23.
- 3.4 Tube Joints, Headers, and Drums shall be repaired as specified in NBBI NB-23.
- 3.5 Material and Equipment removed for access to the boiler or to make repairs shall be reinstalled following successful completion of performance tests and authorization of the Contracting Officer.
- 3.6 Repairs to Pressure Parts shall be inspected and tested as specified in NBBI NB-23. The Contractor shall submit the Inspection Certificate to the Contracting Officer.

END OF SECTION 15620



## SECTION 15621

### CAST-IRON BOILERS AND FIREBOXES

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of cast-iron boilers and fireboxes. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Contractor shall comply with Corpus Christi Army Depot regulations concerning the installation of the boilers, and shall file with that department all required information before starting the boiler installation.
- 2.2 Boilers shall have been approved by the Corpus Christi Army Depot.
- 2.3 Boilers and specified trim shall be constructed in strict accordance with the ASME Boiler and Pressure Vessel Code and its Agenda in effect at the time of bid, and with the requirements of any other public authorities having jurisdiction. Boilers shall be not less than the rating shown on the drawings, and the height shall fit the space available, leaving ample allowance for drawing tubes, smoke connections, piping, etc. No dampers shall be furnished for the boilers.
- 2.4 Furnace volume of each boiler(above the floor refractory) shall not be less than SBI minimum requirement for mechanical draft operation.
- 2.5 All materials used in the fabrication of the boilers shall be manufactured in the United States.
- 2.6 Contractor shall submit to the with the shop drawings an affidavit from the boiler manufacturer stating that all materials used in the fabrication of the boiler have been manufactured in the United States. In addition, before delivering the boiler, he shall furnish a copy of the manufacturer's purchase orders for the tubes, sheets, etc. used in its manufacture.
- 2.7 Shop Drawings: Contractor shall submit to the Contracting Officer for approval complete shop drawings and specifications of the boilers, showing all dimensions, plate thickness, method of staying, staybolt layout supports, outlets, manholes, refractory, and other essential details. The affidavit specified in paragraph 2.6 shall be included with the shop drawings.
- 2.8 Approved Makes: Boilers manufactured by Smith, Weil McClean, Burnham Corp., Federal Boiler Co., Dewanee Boiler Corp., or Cleaver Brooks or approved equal, built in strict accordance with the specifications, drawings and job conditions, will be approved.
- 3.0 EXECUTION:
- 3.1 No Personnel shall enter the boiler until it has been removed from service, cooled, drained, and purged, and the atmosphere has been checked and found to be free of toxic or explosive gases.



- 3.2 Repair and Maintenance work shall be performed in accordance with procedures developed by the Contractor, in compliance with requirements of the ASME Boiler and Pressure Vessel Code and the NBBI National Board Inspection Code, and approved by the Contracting Officer.
- 3.3 Clean Fireside Surfaces: Thoroughly clean flueway and firebox surfaces.
- 3.4 Clean Waterside Surfaces to remove sludge and sediment.
  - 3.4.1 On Steam Boilers, open blowdown valve and flush water until clear while under steam pressure. On water boilers, open boiler drain cock to remove sludge and sediment that have settled to the bottom. Then refill boiler to correct water level for steam boilers or correct water pressure for water boilers.
  - 3.4.2 If Boiler is Shut Down, remove plugs and open drain cock. wash the inside of the boiler with water to remove sludge and sediment. Fill boiler and drain again. Fill boiler to correct level or pressure.
- 3.5 Replace Damaged Boiler Section: Clean seating surfaces and replace gaskets or sealant before installing boiler sections.
- 3.6 Repair Cracks by brazing in compliance with the ASAE Code Section IV and Section IX.
- 3.7 Closing the Boiler:
  - 3.7.1 Manholes, Handholes, and Gaskets: Clean seating surfaces, replace old gaskets with new gaskets, and reinstall or close all manholes and handholes.
  - 3.7.2 Other Materials: The repair shall not be covered by replaced or reinstalled materials until authorized.
- 3.8 Inspection:
  - A. The boilers shall be inspected during construction in the shop of the manufacturer by an inspector of an approved boiler insurance company, or of a State Labor Department. After completion of construction, each boiler shall be successfully tested at the shop at 60 psi hydrostatic pressure. The boiler shall be stamped legibly with all identifying marks and symbols, the manufacturer's name, the allowable working pressure in pounds per square inch, the year of manufacture, and all other markings required by the latest editions of the Illinois. State and the ASME Boiler Codes. Insulating covering shall be left off the above stampings.
  - B. Furnish and deliver in duplicate, one copy to the Contracting Officer, a certificate of test and inspection for each boiler issued by the boiler insurance company or State Labor Department which made the inspection. These certificates shall furnish all data required by the State of Illinois and ASME Codes.
- 3.9 Hydrostatic Test:
  - A. Contractor shall arrange for tests of the boilers at 22 1/2 psi hydrostatic pressure by the Corpus Christi Army Depot, and shall pay all fees involved. He shall notify the Contracting Officer by letter, at least 48-hours in advance of the time at which such tests are to be made. (The safety valves shall be gagged during the 22 1/2 psi test, and then shall be hydrostatically tested at 15 psi.)
  - B. Each boiler shall be connected completely, including water feed, steam connections, trimming, surface and bottom blow-offs, etc., with valves inserted in connections to mains, and ends left open until after tests have been applied to prove that the valves are tight under the specified pressure.



## 15000 - Mechanical

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- C. A certificate of the Corpus Christi Army Depot's test shall be obtained by the Contractor, and shall be delivered to the Contracting Officer immediately after the boiler tests have been completed.

END OF SECTION 15621



## SECTION 15623

### SCOTCH MARINE BOILERS

#### 1.0 - GENERAL

##### 1.1 SUMMARY

- A. Section includes Packaged, Factory-Assembled and Tested, Firetube (hot water) Boilers, Trim, and Accessories.
- B. In the case where it is impossible to bring in the boiler as a single packaged, Contractor may bring the boiler in sections and field fabricated, and in that case comply with Applicable ASME Codes and AWS Standards Codes, including Welder's Qualification, Welding Details and Workmanship Standards. Also comply with Texas Boiler Code.

##### 1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data, including rated capacities of selected model, clearly indicating, dimensions, weights (shipping, installed, and operating), required clearances, furnished specialties and accessories; and installation and start-up instructions.
- B. Shop Drawings: Submit ladder-type wiring diagrams for power and control wiring required for final connections, to boilers and controls. Clearly differentiate between portions of wiring that are factory-installed and portions to be field-installed.
- C. Maintenance Data: Submit maintenance data and parts list for boilers, controls, and accessories; including "trouble-shooting" maintenance guide and preventative maintenance schedule and procedures. include this data and product data in maintenance manual; in accordance with requirements of Division 1.
- D. Test Report: Submit a factory inspection report prior to shipping.

##### 1.4 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of scotch marine boilers, of types and capacities required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Codes and Standards:
  - 1. Boiler Testing and Rating: in accordance with American Boiler Manufacturer's Association (ABMA) "Packaged Firetube Rating".
  - 2. Minimum Steady State Efficiency of Boilers: Not less than prescribed by ASHRAE 90A Energy Conservation In New Building Design".



## 15000 - Mechanical

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3. Low Pressure Boiler Construction: in accordance with American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section IV. pressure Vessel shall bear ASME label.
4. Control Devices and Control Sequences: In accordance with requirements of Factory Mutual System (FM).
5. Control Devices and Control Sequences: In accordance with requirements of Industrial Risk Insurers (IRI).
6. Installation Standards: Oil-fired boilers shall be in accordance with National Fire Protection Association (NFPA) Standard 31 "Standard for the Installation of Oil Burning Equipment".
7. Installation Standards: Gas-fired boilers shall be in accordance with National Fire Protection Association (NFPA) Code 54 "National Fuel Gas Code".
8. Ancillary electrical components shall be Underwriters Laboratories (UL) listed and labeled.
9. Comply with Texas Boiler Code.

### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Handle boilers and components carefully to prevent damage, breaking, denting and scoring. Do not install damaged boilers or components; replace with new.
- B. Store boilers and components in clean dry place. protect from weather' dirt, fumes, water, construction debris, and physical damage.
- C. Rig boilers in compliance with manufacturer's rigging and moving instructions for unloading scotch marine boilers, and moving them to final location.

### 1.6 SEQUENCE AND SCHEDULING

- A. Coordinate the size and location of housekeeping concrete pads on which boilers are to be mounted. Coordinate required imbedded anchor devices.

## 2.0 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Available Manufacturer's: Subject to compliance with requirements, manufacturers offering packaged firetube boilers which may be incorporated in the work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide packaged firetube boilers of one of the following:
  1. Barnham Corp; Hydronics Div.
  2. Cleaver-Brooks; Div Aqua-Chem, Inc.
  3. Hurst Boiler Co.
  4. Kewanee Boiler Corp.
  5. Sellers Engineering Co.
  6. Superior Boiler Works, inc.



7. York-Shipley, Inc.

## 2.2 PACKAGED FIRETUBE BOILERS

- A. General Description: Scotch marine boilers shall be factory- assembled and tested, packaged, multi-pass, horizontal firetube boilers of dry or wet back type. Boilers shall be factory-mounted on heavy steel base frame, complete with integral forced draft burner, burner controls, boiler trim, and refractory. Factory- assemble and wire boilers so that only water, steam, fuel, blowdown, electrical, and vent connections are required.
  - 1. Provide 5 sq. ft of heating surface per rated bhp.
  - 2. Capacities and electrical characteristics are scheduled at the end of this Section.
  - 3. Provide manufacturer's standard number of handholes in boiler shell, and manhole on boilers over 48" in diameter. Provide 2 lifting lugs, permanently attached to top of boiler.
- B. Front and Rear Doors: hinged or davited, sealed with heat resistant gaskets, and fastened with lugs and cap-screws. Design doors so front and rear tube sheets and all flues are fully accessible for inspection and cleaning when doors are open.
  - 1. Provide observation ports at each end of boiler for inspection of flame conditions.
- C. Refractory: Provide refractory and insulation in door construction, accessible for inspection and maintenance.
- D. Exhaust Gas Vent: On top of boiler, complete with stack thermometer.
- E. Insulation and Jacket: Minimum of 2" thick fiberglass blanket insulation on boiler shell, cover with sheet metal jacket of manufacturer's standard gage.
- F. Painting: Factory-painted hard enamel finish on boiler, base frame, and components assembly.
- G. Hot Water Boiler Trim:
  - 1. Hot Water Connections: Supply and return connection locations shall provide internal thermal circulation which will mix return water with hot water in boiler.
  - 2. Dip Tube: An integral part of the hot water outlet, and air vent tapping in boiler shell for removal of entrained air.
  - 3. Low Water Cutoff: Mounted on the side of boiler; factory-wired into burner control circuit to prevent burner operation if boiler water falls below safe level.
  - 4. Pressure and Temperature Gages: Mounted on boiler, with temperature sensing element located adjacent to the hot water outlet.
  - 5. Water Relief Valves: of type and size to comply with ASME Code requirements.
  - 6. Temperature Controls: To regulate burner operation; mounted temperature sensing elements adjacent to hot water outlet.
  - 7. All brass tom with crosses and tees at right angles and Hartford loop connection to comply with Texas Codes.
  - 8. Blend pump.
- H. Burners:



## 15000 - Mechanical

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1. Furnish and install only manufacturer's standard combination gas/oil burner, size and capacity, listed in specific requirements which follows all capacities.
2. The burners will be forced draft type pressure atomizing. All combustion air shall be supplied by the burner fan which is an integral part of the burner. Horsepower of each burner motor shall be listed in specific requirements. Burners must have sufficient capacity to overcome the furnace pressure where applicable and capable of operating on a negative or positive furnace pressure.
3. The gas/oil burners shall burn the specified quantity of fuel without excessive vibration, noise or pulsation.
4. Supply voltage available will be 120 or 240 volts, single phase cycle (see specific requirements for exact voltage). All burner controls are to be for control voltage shall be supplied through an isolating stepdown control transformer from the supply voltage. Transformer to be supplied as part of the burner controls and mounted on the control cabinet. All burner motors will be equipped with "NEMA rated" starters and overloads.
5. Burner to be equipped with low fire warm-up interlock, with adjustment range of 90 to 230 degrees of water or steam.
6. A pilot shut off cock, gas pressure regulator, and automatic pilot gas valve shall be provided for each burner. The pilot ignition shall be of the gas/electric interrupted type.
7. The approved automatically operated safety shutoff valves shall be provided in the oil supply line to the burner, valves to be piped in series, but wired in parallel.
8. Oil pressure gauges with isolating valves shall be provided on both the suction side of the oil pumps, high pressure side and bypass. All gauges shall be liquid fill type.
9. Burner oil supply piping will be equipped with new canister type filters, rated for suction gear capacity of oil pump, firestop, Webster OSV and supply and return check valves. Units to be tied into existing oil supply/return lines.
10. Combination gas/oil burners shall be UL and I.R.I. approved.
11. The burner assembly will be wired via flexible liquid tight conduit of adequate length and arrangement to allow the burner to be removed for accessibility to the firebox without electrical disconnection.
12. All wiring will be not less than 14 gauge copper standard 90 degrees Celsius THHN or 105 degrees Celsius PVC/MTW 600 volt rated insulation.
13. The gas train piping shall include a 1/4" NPI pressure tapping and 1/4" pipe plug upstream and downstream of each valve and regulator in the gas train.
14. Provide a gas pressure gauge and isolating valve to indicate the gas burner manifold pressure. (Range will be 0 to 30 inches water column).
15. Furnish and install a complete I.R.I. main gas train (gas train must be vented to atmosphere and installed as per Texas Codes) on each burner to include:
  - a. One motorized gas valve with proof of closure switch, one standard motorized valve, manual reset high and low gas pressure regulator, All gas trains must be factory assembled and furnished by the burner manufacturer.





16. Main gas pressure regulators shall be of the tight shut off type Maxitrol 210 or equal series to match boiler where available gas pressure is 1 p.s.i.g. or over, and Maxitrol RV series where pressure is below 1 p.s.i.g.
  17. Burners shall be capable of burning natural gas and No. 2 fuel oil. Burners shall be adjusted to burn no 2 fuel oil and natural gas, fuel oil pump shall be remote mounted or on Burner Skid.
  18. Burner flame length shall not be in contact (touch) with boiler combustion chamber target wall or rear wall. Burner flames that touch target or rear walls will not be acceptable. Factory certification shall be provided upon request.
  19. Firing head shall incorporate a removable air diffuser. All firing head components shall be removable from the rear of the burner.
  20. Burner manufacturer shall base performance rating of burner within a CO<sub>2</sub> range of 12 percent at high fire and 10 percent at low fire when firing on oil, and 9 percent when firing on gas.
  21. The maximum published catalogue capacities of each burner shall not exceed the specified capacities for each burner by a margin greater than 10 percent. Burners with capacities greater will not be acceptable.
  22. In order to facilitate inspections, all burner firing head components including diffusers must be removable from the rear of the burner and when removed, unimpeded access to the full length of the burner blast tube shall result.
- I. Burner Controls:
1. Burners shall have electric full modulation and shall be controlled by a potentiometer mounted on the boiler.
  2. A manual reset high limit control and an automatic high limit reset control furnished on independent lappings.
  3. A manual restart of the burner shall be necessary in event of shutdown due to flame failure.
  4. Supply a combustion air flow switch and low fire proving switch, burner mounted to prevent the energization of the main fuel valves in the event of insufficient combustion.
  5. A factory prewired control cabinet shall be supplied with each burner. Cabinet shall be free standing or burner mounted NEMA Type 12, 14 gauge steel with chrome key lock handle. Cabinet shall have 3 point latching doors, fully gasketed to NEMA standards. Cabinet shall house:
    - a. Flame safeguard control
    - b. Blower motor starter 3 phase
    - c. Oil pump motor starter 3 phase
    - d. Circuit Breaker - Blower Motor
    - e. Circuit Breaker - Oil Pump
    - f. Circuit Breaker - Control Circuit



## 15000 - Mechanical

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- g. Fuses, control switches, indicating lights and relays that may be required.
- 6. The changing from one fuel to the other shall be manual by means of fuel selector switch. No burner adjustments or mechanical disconnects shall be required to switch from one fuel to the other.
- 7. Fuel air control must be synchronized. The electric modulating motor shall be provided with a low fire interlock switch to assure starting in the low-fire position, with an adjustment range of 90 to 230 degrees of water or steam.
- 8. Pre-ignition purge air flow shall be no less than 60 percent of the maximum firing rate air flow via and proving interlock.
- 9. Hi-Low modulation of fuel input shall be provided. Provide on the control cabinet a manual auto switch and potentiometer for manual control of the firing rate.
- 10. A microcomputer safety combustion control shall be supplied complete with scanner to monitor the main gas or oil flame and the gas pilot ignition flame. It shall be utilized to provide an interrupted type gas-electric ignition of the main flame on either fuel. The scanner shall prove the pilot or main burner flame by infrared radiation. The programming controller shall be a Fireye Model E Series Model No. E100 - EP - 160 -EIRI flame monitor system or equal.
- 11. Burner manufacturer shall factory mount, wire and install in each burner cabinet, a Fireye E Series flame monitor system or equal. In addition each unit shall have the E300 expansion module.
- 12. Provide with each control cabinet a common alarm bell with a momentary pushbutton switch ring in the event of either low water or flame failure. Individual alarm lights shall also indicate these conditions.
- 13. Oil pressure supervision shall be provided by an approved pressure switch interlock to accomplish a non-recycling safety shutdown in the event of low oil pressure.
- 14. Provide aquastat on each boiler for use of low fire hold and wired through the modulating circuit. The intent of this aquastat is to hold the burner in the low fire mode until the water temperature in the boiler reaches 120 Degree F. This is to help prevent thermal shock to the boiler.
- 15. Provide on control cabinet, indicating lights with engrave nameplates to indicate "Power On", "Call for Heat", "Ignition", "Main Fuel Valve", "Main Flame Failure" and "Low Water".
- 16. Final burner adjustments, maximum firing rate will be set and verified by clocking the gas meter, oil firing rate shall be adjusted (aftergas) with a minimum of 3 points O<sub>2</sub> or CO<sub>2</sub> at number 1 smoke, overfire and breaching draft as per manufacturer's specifications, recorded gas and oil pressures, and stack temperature at final adjustment at high pressure supply and bypass.
- 17. Boiler manufacturers shall be one of the following:
  - 1. Gordon Piatt
  - 2. Power Flame
  - 3. Industrial Combustion



### 2.3 SOURCE QUALITY CONTROL

- A. Boiler Shell: Designed, constructed, and hydrostatically tested in accordance with ASME Boiler and Pressure Vessel Code; and bearing the appropriate ASME label.
  - 1. For boilers designed for 15 psi steam or for hot water operation not exceeding 250 dog F (121 deg C), construct in accordance with Section IV "Heating Boilers".

## 3.0 - EXECUTION

### 3.1 EXAMINATION

- A. Examine and verify size, location, and condition of concrete pads upon which boilers are to be installed. Do not proceed with installation until unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. General: Install boilers in accordance with manufacturer's installation instructions, requirements State and local code and requirements of local Utility Company. Install units plumb and level, to tolerance if 1/8" in 10' in both directions. Maintain manufacturer's recommended clearances around and over boilers.
- B. Support: install scotch marine boilers on 4" high concrete pad, 4" larger on each side than base of unit.
- C. Erection: Assemble boiler trim shipped loose or unassembled for shipment purposes. Follow manufacturer's installation instructions
- D. Gas Piping: Refer to Section 15488 "Natural Gas Systems". Connect gas piping to boiler, full size of boiler gas train inlet, provide union with sufficient clearance for burner removal and service.
- E. Steam and Condensate Piping: Refer to Section 15520 "Steam and Condensate Piping" connect supply, return, and Slowdown boiler lappings as indicated, with shutoff valve and union or flange at each connection.
- F. Breeching: Refer to Section 15575 "Breechings, Chimneys, and Stacks". Connect breaching to boiler outlet, full size of outlet.
- G. Electrical: Refer to Section 16481 "Motor Controllers".

### 3.3 CLEANING

- A. Flush and clean boilers upon completion of installation, in accordance with manufacturer's instructions.

### 3.4 FIELD QUALITY CONTROL

- A. Hydrostatically test assembled boiler and piping in accordance with applicable sections of ASME Boiler and pressure Vessel Code.
- B. Arrange with National Board of Boiler and Pressure Vessel inspectors for inspection of boiler installation, piping connections, observation of hydrostatic testing, and for certification of completed boiler units.

### 3.5 DEMONSTRATION



## 15000 - Mechanical

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- A. Services: After testing and inspection is complete, provide the services of an authorized factory service representative to perform start-up and operation demonstration services.
- B. Start-up: Perform services in accordance with manufacturer's written start-up instructions. Test controls and demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.
- C. Maintenance and Operation Training: As a part of the maintenance and operating instructions, review data in operating and maintenance manual, including preventative maintenance schedule and procedures, and procedures for obtaining repair parts and technical assistance. Demonstrate all phases of operation including start-up and shut-down.
  - 1. Schedule training with Owner, provide at least 7-day notice to Contracting

END OF SECTION 15623



## SECTION 15624

### WATER TUBE BOILERS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of water tube boilers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
  - 2.1 Contractor shall comply with Corpus Christi Army Depot regulations concerning the installation of the boilers, and shall file with that department all required information before starting the boiler installation.
  - 2.2 Boilers shall have been approved by the Corpus Christi Army Depot.
  - 2.3 Design and Materials:
    - 2.3.1 Boilers and specified trim shall be constructed in strict accordance with the ASME Boiler and Pressure Vessel Code and its Addenda in effect at the time of bid, and with the requirements of any other public authorities having jurisdiction. Boilers shall be not less than the rating shown on the drawings, and the height shall fit the space available, leaving ample allowance for drawing tubes, smoke connections, piping, etc. No dampers shall be furnished for the boilers.
    - 2.3.2 Furnace volume of each boiler (above the floor refractory) shall not be less than SBI minimum requirement for mechanical draft operation.
    - 2.3.3 All materials used in the fabrication of the boilers shall be manufactured in the United States.
    - 2.3.4 Contractor shall submit with the shop drawings an affidavit from the boiler manufacturer stating that all materials used in the fabrication of the boiler have been manufactured in the United States. In addition, before delivering the boiler, he shall furnish a copy of the manufacturer's purchase orders for the tubes, sheets, etc. used in its manufacture.
  - 2.4 Shop Drawings: Contractor shall submit to the Contracting Officer for approval complete shop drawings and specifications of the boilers, showing all dimensions, plate thickness, method of staying, staybolt layout, supports, outlets, manholes, refractory, and other essential details. The affidavit specified in Par. 2.3.4 shall be included with the shop drawings.
  - 2.5 Approved Makes: Boilers manufactured by Burnham Corp., Federal Boiler Co., or Kewanee Boiler Corp., or Cleaver Brooks or equal approved by the Contracting Officer.
- 3.0 EXECUTION:
  - 3.1 No Personnel shall enter the steam drum or lower drum until the boiler has been removed from service, cooled, drained, and purged and all steam and water valves, including drain and blowdown valves, have been closed, and locked or tagged. No personnel shall enter the boiler until the atmosphere in the boiler has been checked and found to be free of toxic or explosive gases.



## 15000 - Mechanical

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- 3.2 Repair and Maintenance Work shall be performed in accordance with procedures developed by the Contractor that are in compliance with requirements of the ASAE Boiler and Pressure Vessel Code and the NBBI National Board Inspection Code.
- 3.5 Waterside (Internal) Repairs: Wash drum internals to remove loose and soft deposits. Turbine the water tubes. Perform chemical cleaning by either circulation or soaking.
- 3.6 Cracks in Drums shall be repaired in compliance with the NBBI National Board Inspection Code.
- 3.7 Tube Seat Leaks may be repaired by internal seal welding of the tubes in compliance with National Board Inspection Code,
- 3.8 Fireside (External) Repairs:
  - 3.8.1 Clean Deposits from fireside surfaces by washing with hot alkaline water, brushing, scraping, or air lancing. Surfaces shall be dried immediately after washing.
  - 3.8.2 Corroded Surfaces may be built up by fusion welding in compliance with the NBBI National Board Inspection Code Chapter VI.
  - 3.8.3 Drum Shell Patches shall be designed and installed in compliance with NBBI National Board Inspection Code.
  - 3.8.4 Minor Cracks in tube shall be repaired by replacement of a tube section. Minimum length of replacement tube section shall be 12 inches. Use backing rings when sections are welded into existing tubes. Use the TIG (tungsten-inert-gas) process for the root pass.
  - 3.8.5 For Major Tube Damage, replace entire tube. If only one or two tubes require replacement, the damaged tubes may be removed and the holes plugged if approved by the Contracting Officer.
  - 3.8.6 Seal Welds used for fluid tightness shall be applied in compliance with the NBBI National Board Inspection Code recommendations.
- 3.9 Closing the Boiler:
  - 3.9.1 Manholes, Handholes, and Gaskets: Clean seating surfaces, replace old gaskets with new gaskets, and reinstall or close all man-holes and handholes.
  - 3.9.2 The Repair shall not be covered by replaced or reinstalled materials until authorized.
- 3.10 Inspection:
  - A. The boilers shall be inspected during construction in the shop of the manufacturer by an inspector of an approved boiler insurance company, or of a State Labor Department. After completion of construction, each boiler shall be successfully tested at the shop at 60 psi hydrostatic pressure. The boiler shall be stamped legibly with all identifying marks and symbols, the manufacturer's name, the allowable working pressure in pounds per square inch, the year of manufacture and all other markings required by the latest editions of the Illinois State and the ASME Boiler Codes. Insulating covering shall be left off the above stampings.
  - B. Furnish and deliver in duplicate, one copy to the Contracting Officer, a certificate of test and inspection for each boiler issued by the boiler insurance company or State Labor Department which made the inspection. These certificates shall furnish all data required by the State of Illinois and ASME Codes.



3.11 Hydrostatic Test:

- A. Contractor shall arrange for tests of the boilers at 22 1/2 psi hydrostatic pressure by the Corpus Christi Army Depot, and shall pay all fees involved. He shall notify the Contracting Officer by letter, at least 48-hours in advance of the time at which such tests are to be made. (The safety valves shall be gagged during the 22 1/2 psi test, and then shall be hydrostatically tested at 15 psi.)
- B. Each boiler shall be connected completely, including water feed, steam connections, trimming, surface and bottom blow-offs, etc., with valves inserted in connections to mains, and ends left open until after tests have been applied to prove that the valves are tight under the specified pressure.
- C. A certificate of the Corpus Christi Army Depot test shall be obtained by the Contractor, and shall be delivered to the Contracting Officer immediately after the boiler tests have been completed.

END OF SECTION 15624



## SECTION 15625

### FIRE TUBE BOILERS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of fire tube boilers. Products shall match existing material, and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
- 2.1 Contractor shall comply with Corpus Christi Army Depot regulations concerning the installation of the boilers, and shall file with that department all required information before starting the boiler installation.
- 2.2 Boilers shall have been approved by the Corpus Christi Army Depot.
- 2.3 Design and Materials:
- 2.3.1 Boilers and specified trim shall be constructed in strict accordance with the ASME Boiler and Pressure Vessel Code and its Addenda in effect at the time of bid, and with the requirements of any other public authorities having jurisdiction. Boilers shall be not less than the rating shown on the drawings, and the height shall fit the space available, leaving ample allowance for drawing tubes, smoke connections, piping, etc. No dampers shall be furnished for the boilers.
- 2.3.2 Furnace volume of each boiler (above the floor refractory) shall not be less than SBI minimum requirement for mechanical draft operation.
- 2.3.3 All materials used in the fabrication of the boilers shall be manufactured in the United States.
- 2.3.4 Contractor shall submit with the shop drawings an affidavit from the boiler manufacturer stating that all materials used in the fabrication of the boiler have been manufactured in the United States. In addition, before delivering the boiler, he shall furnish a copy of the manufacturer's purchase orders for the tubes, sheets, etc. used in its manufacture.
- 2.4 Shop Drawings: Contractor shall submit to the Contracting Officer for approval complete shop drawings and specifications of the boilers, showing all dimensions, plate thickness, method of staying, staybolt layout, supports, outlets, manholes, refractory, and other essential details. The affidavit specified in Par. 2.3.4 shall be included with the shop drawings.
- 2.5 Approved Makes: Boilers manufactured by Burnham Corp., Federal Boiler Co., or Kewanee Boiler Corp., or Cleaver Brooks or approver equal by the Contracting Officer.
- 3.0 EXECUTION:
- 3.1 No Personnel shall enter the boiler until the boiler has been removed from service, cooled, drained, and purged and the atmosphere in the boiler has been checked and found to be free of toxic or explosive gases.





- 3.2 Repair and Maintenance Work shall be performed in accordance with procedures developed by the Contractor that are in compliance with requirements of the ASME Boiler and Pressure Vessel Code and the NBBI National Board Inspection Code .
- 3.3 Waterside Repairs: Wash drum internals to remove loose scale and soft deposits prior to making repairs.
- 3.4 Fireside Repairs:
- 3.4.1 Remove Soot and Other Deposits from furnace tube, fire tubes, and tube sheets.
- 3.4.2 Cracks at the junction of the furnace tube and tube sheet shall be repaired by welding.
- 3.4.3 Boiler Shell and Tube Sheet Patches shall be designed and installed in compliance with the National Board Inspection Code Chapter VI. All patches shall comply with the requirements for new construction of ASME Code Section I and IV.
- 3.4.4 Damaged Fire Tubes shall be removed and replaced with new tubes, except for a single leaking tube, which may be repaired by plugging at tube sheet at both ends.
- 3.4.5 Corroded Surfaces may be built up by fusion welding in compliance with the NBBI National Board Inspection Code recommendations.
- 3.4.6 Seal Welds used for fluid tightness shall be applied in compliance with the NBBI National Board Inspection Code recommendations.
- 3.5 Closing the Boiler:
- 3.5.1 Manholes, Handholes, and Gaskets: Clean seating surfaces, replace old gaskets with new gaskets, and reinstall or close all manholes and handholes.
- 3.5.2 Front and Rear Door: Clean seating surface, replace gaskets, and close front and rear access doors.
- 3.5.3 The Repair shall not be covered by replaced or reinstalled materials until authorized by the pertinent authorities.
- 3.6 Inspection:
- A. The boilers shall be inspected during construction in the shop of the manufacturer by an inspector of an approved boiler insurance company, or of a State Labor Department. After completion of construction, each boiler shall be successfully tested at the shop at 60 psi hydrostatic pressure. The boiler shall be stamped legibly with all identifying marks and symbols, the manufacturer's name, the allowable working pressure in pounds per square inch, the year of manufacture and all other markings required by the latest editions of the Illinois State and the ASME Boiler Codes. Insulating covering shall be left off the above stampings.
- B. Furnish and deliver in duplicate, one copy to the Contracting Officer, a certificate of test and inspection for each boiler issued by the boiler insurance company or State Labor Department which made the inspection. These certificates shall furnish all data required by the State of Illinois and ASME Codes.
- 3.7 Hydrostatic Test:
- A. Contractor shall arrange for tests of the boilers at 22 1/2 psi hydrostatic pressure by the Corpus Christi Army Depot, and shall pay all fees involved. He shall notify the Contracting Officer by



## 15000 - Mechanical

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letter, at least 48-hours in advance of the time at which such tests are to be made. (The safety valves shall be gagged during the 22 1/2 psi test, and then shall be hydrostatically tested at 15 psi.)

- B. Each boiler shall be connected completely, including water feed, steam connections, trimming, surface and bottom blow-offs, etc., with valves inserted in connections to mains, and ends left open until after tests have been applied to prove that the valves are tight under the specified pressure.
- C. A certificate of the Corpus Christi Army Depot test shall be obtained by the Contractor, and shall be delivered to the Contracting Officer immediately after the boiler tests have been completed.

END OF SECTION 15625



## SECTION 15639a

### BOILER ACCESSORIES

#### 1.0 - GENERAL

##### 1.1 DESCRIPTION OF WORK:

- A. Extent of boiler accessories work required by this section is indicated on drawings and schedules, and by requirements of this section.
- B. Types of boiler accessories specified in this section include the following:
  - 1. Boiler valves.
  - 2. Stop and check valves.
  - 3. Y-type blowdown valves.
  - 4. Safety and relief valves.
  - 5. Steam safety valves.
  - 6. Water relief valves.
  - 7. Boiler blowdown separators.
  - 8. Boiler water treatment feeders.
  - 9. One-shot feeders.
  - 10. Bypass feeders.
  - 11. Treatment pump feeders.
  - 12. Boiler Economizers

Refer to other Division-15 sections for boilers, piping, specialties, concrete pads, etc., required for installation of boiler accessories; not work of this section.

##### 1.2 QUALITY ASSURANCE:

1.2.1 Manufacturer's Qualifications: Firms regularly engaged in manufacture of boiler accessories, of types and capacities required, whose products have been in satisfactory use in similar service for not less than 5 years.

##### 1.2.2 Codes and Standards:

- A. ASME Compliance: Construct and install boiler accessories in accordance with ASME "Boiler and Pressure Vessel Code". Install boiler accessories in accordance with ASME B31.1 "Power Piping", or ASME B31.9 "Building Services Piping", as applicable.

##### 1.3 SUBMITTALS:



## 15000 - Mechanical

- 1.3.1 Product Data: Submit manufacturer's technical product data, including rated capacities of selected model clearly indicated, weights (shipping, installed, and operating where applicable), furnished specialties and accessories; and installation and start-up instructions.
- 1.3.2 Shop Drawings: Submit manufacturer's assembly-type shop drawings indicating dimensions, weight loadings, required clearances, and methods of assembly of components.
- 1.3.3 Wiring Diagrams: Submit ladder-type wiring diagrams for electrically operated boiler accessories. Clearly differentiate between portions of wiring that are factory-installed and portions to be field-installed.
- 1.3.4 Maintenance Data: Submit maintenance data and parts lists for each boiler accessory, including "troubleshooting" maintenance guide. Include this data and product data in maintenance manual; in accordance with requirements of Division 1.

### 2.0 - PRODUCTS

#### 2.1 BOILER VALVES:

- 2.1.1 General: Provide factory-fabricated boiler valves recommended by manufacturer for use in service indicated. Provide boiler valves of types and pressure ratings indicated for each service, or if not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide sizes as indicated, with connections which properly mate with pipe, tube, and equipment connections.
- 2.1.2 Stop and Check Valves: Construct body of cast iron, ASTM A 126, Grade B. pressure rated for 250 PSI at 450°F (232°C) steam. Provide OS&Y construction, straight or angle pattern with flanged ends, and renewable bronze disc and seat ring.
- 2.1.3 Y-Type Blowdown Valves: Construct body of bronze, ASTM B 62, . pressure rated for 150 PSI steam. Provide Y-type globe construction, bronze seat ring, renewable composition disc, 6crew-in bonnet, and threaded ends.
- 2.1.4 Y-Type Blowdown Valves: Construct body of bronze, ASTM B 62, pressure rated for 300 PSI steam. Provide Y-type globe construction, bronze seat ring, renewable composition disc, screw-in bonnet, threaded ends.
- 2.1.5 Available Manufacturers: Subject to compliance with requirements, manufacturers offering boiler valves which may be incorporated in the work include, but are not limited to, the following:
  - A. Crane Co.; Valves and Fittings Div.
  - B. Fairbanks (The) Co.
  - C. Jenkins Bros.
  - D. Lunkenheimer (The) Co.; Div. of Conval Corp.
  - E. Powell (The Wm.) Co.
  - F. Walworth Co.

#### 2.2 SAFETY AND RELIEF VALVES



- 2.2.1 Steam Safety Valves: Provide steam safety valves as indicated, of size and capacity as selected by Installer for proper relieving capacity, constructed in accordance with ASME Boiler and Pressure Vessel Code.
- A. Bronze Safety Valves: Construct housing of cast bronze, disc and nozzle of forged copper alloy, lap seats to optical flatness. Set valve to relieve at 10 PSI above operating pressure.
  - B. Cast-Iron Valves: Construct of cast iron, with all bronze/bras trim, and fully enclosed spring. Set valve to relieve at 10 PSI above operating pressure.
  - C. Drip Pan Elbows: Provide drip pan elbows on steam safety valves required to discharge to outdoors. Construct of cast iron, with bottom drain and pan drain connections.
  - D. Exhaust Heads: Provide exhaust heads on exhaust steam lines, constructed of cast iron, and consisting of Helico-centrifugal chamber and drain.
  - E. Available Manufacturers: Subject to compliance with requirement ;, manufacturers offering steam safety valves which may be incorporated in the work include, but are not limited to, the following:
    - 1. Kunkle Valve Co., Inc.
    - 2. Lunkenheimer (The) Co.,; Div. of Conval Corp.
    - 3. Spirax Sarco, Inc.
    - 4. Watts Regulator Co.
- 2.2.2 Water Relief Valves: Provide water relief valves as indicated, of size and capacity as selected by Installer for proper relieving capacity, constructed in accordance with ASME Boiler and Pressure Vessel Code.
- A. Pressure Relief Valves: Construct of bronze body, metallic disc, metal seat, with non-mechanically guided stem. Set valve to relieve at 10 PSI above operating pressure.
  - B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering water relief valves which may be incorporated in the work include, but are not limited to, the following:
    - 1. Amtrol, Inc.
    - 2. Bell & Gossett
    - 3. ITT. Spirax sakoo Co.
    - 4. Watts Regulator Co.
- 2.3 BOILER BLOWDOWN SEPARATORS: .
- 2.3.1 General: Provide as indicated, boiler blowdown separators of size and capacity noted on drawings.
- 2.3.2 Tank: Construct of carbon steel, with tangential inlet pipe and stainless steel striking plate, vent opening, discharge opening with spiral formed discharge directing plate, supported on 3 support legs of indicated height.
- 2.3.3 Water Inlet: Provide cold water inlet in discharge pipe, and 2 thermometer wells.



## 15000 - Mechanical

- 2.3.4 Specialties: Provide temperature regulating valve in water inlet with temperature sensing bulb in lower thermometer well; bimetallic thermometer in upper thermometer well; and Y-type strainer in cold water inlet line upstream of temperature regulating valve. Provide backflow prevention device in water inlet.
- 2.3.5 Available Manufacturers: Subject to compliance with requirements, manufacturers offering boiler blowdown separators which may be incorporated in the work include, but are not limited to, the following:
- A. Cleaver Brooks; Div. Aqua-Chem, Inc.
  - B. Penn Separator Corp.
  - C. Wessels Co.
  - D. York-Shipley, Inc.
- 2.4 BOILER WATER TREATMENT FEEDERS:
- 2.4.1. One-Shot Feeders: Provide as indicated, One-shot feeders of size and capacity noted on drawings.
- A. Tank: Construct of cast iron, tapped for 1" feed inlet and outlet in top and bottom, 3/8" drain at bottom, and 3/8" vent and fill at top.
  - B. Specialties: Provide 3/8" petcock in vent opening, 3/8" drain valve in drain opening, and 1-2" funnel with hinged cover and globe valve in fill opening.
  - C. Available Manufacturers: Subject to compliance with requirements, manufacturers offering one-shot feeders which may to, the following:
    - 1. York-Shipley, Inc.
- 2.4.2 Bypass Feeders: Provide as indicated, bypass feeders of size and capacity noted on drawings.
- A. Tank: Construct of cast iron, tapped for 1" feed inlet and outlet in bottom and top, fill inlet at top, gage glass Lappings in side, and drain tapping in bottom.
  - B. Specialties: Provide 1-2" funnel with hinged cover and globe valve in fill opening, 3/8" drain valve in drain opening, and gage glass with flow regulator and vent petcock in gage glass openings.
  - C. Available Manufacturers: Subject to compliance with requirements, manufacturers offering bypass feeders which may be incorporated in the work include, but are not limited to, the following:
  - D. Manufacturer: Subject to compliance with requirements, provide bypass feeders of one of the following:
    - 1. York-Shipley, Inc.
- 2.4.3 Treatment Pump Feeders: Provide as indicated, treatment pump feeders of size and capacity noted on drawings.
- A. Pump: Positive-displacement type, with ball-bearing gear head motor with 60 rpm output, mounted on steel baseplate. Provide double stainless steel check valves and valve balls. Construct drive piston of ground and polished stainless steel, and pump barrels of steel. Provide manual adjustment of pumping capacity from zero to maximum.



- B. Solution Tank: Provide 100-gal solution tank constructed of corrosion resisting material, with i-hinged lid, sight gage glass, legs, and base to mount pump. Factory-pipe with line strainer and relief valve on pump discharge.
  - C. Available Manufacturers: Subject to compliance with requirements, manufacturers offering treatment pump feeders which may be incorporated in the work include, but are not limited to, the following:
    - 1. Cleaver Brooks; Div., Aqua-Chem, Inc.
    - 2. Mogul; Div. of the Dexter Corp.
    - 3. York-Shipley, Inc.
- 2.5 BOILER ECONOMIZERS:
- 2.5.1 General: Provide finned tube boiler economizers of sizes and having capacities and performance characteristics as indicated, and as specified herein.
  - 2.5.2 Type: Provide horizontal tube, counter-current flow arrangement, designed, manufactured, and tested in accordance with ASME Boiler and Pressure Vessel Code. Provide ASME Stamp.
  - 2.5.3 Construction: Construct economizer heating surface of 2"t OD boiler tubes with smooth carbon steel fins, not less than 0.075" thick, attached ~ by continuous high-frequency resistance welding. Provide maximum fin density (pitch) of 60 fins/ft.
  - 2.5.4 Tube Arrangement: Provide square pitch for lane blowing of sootblowers.
  - 2.5.5 Headers: Provide schedule 40 carbon steel pipe with minimum 300 PSI flanged connections. Provide 3/4" drain connection on lower header, and 3/4" vent connection on upper header. ;
  - 2.5.6 Enclosure: Provide gas-tight, hot structure design allowing unrestricted flow of hot gas over internal parts. Allow fin tips only, not tube walls, to be in contact with tube sheets. Construct inner casing of enclosure of 3/16" thick: carbon steel. Furnish enclosure with minimum of 2" thick, factory-installed, high temperature insulation covered with corrugated, galvanized, carbon steel jacket. Paint exterior surfaces not covered with galvanized jacket with high temperature aluminum paint. Provide 16' x 16' cart steel insulated access door for inspection and cleaning. .
  - 2.5.7 Sootblowers: Furnish economizer with one or more sootblowers as required to obtain full coverage of heating surfaces. Install sootblowers transverse to axis of finned tubes for lane blowing.
    - A. Provide manually operated sootblowers.
    - B. Provide motor-operated sootblowers with remote pushbutton control. ~
  - 2.5.8 Drainage: Provide economizers that are completely drainable by gravity-after installation.
  - 2.5.9 Feedwater Control System: Provide feedwater corrosion control system to prevent cold-end corrosion of economizer, and to control exit gas temperatures. Design system to elevate entering water temperature to control exit gas temperature and tube metal temperature; and to automatically maintain or adjust feedwater temperature to provide corrosion protection under all boiler operating loads. . Provide factory-assembled system consisting of the following:
    - A. Heat exchanger mounted on steel supporting skid.;



## 15000 - Mechanical

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- B. Self-contained led dual piloted tight shutoff temperature control valve with integral temperature adjustment to control flow of steam to pre-heater.
- C. Feedwater pre-heater outlet water vapor tension thermostat with well and : Flexible armored tubing connected to temperature regulator. Install thermostat in pre-heater leaving water piping.
- D. Exit gas temperature vapor tension thermostat with flexible armored tubing connected to temperature regulator. Install thermostat in exit flue gas duct.

2.5.10 Available Manufacturers: Subject to compliance with requirements, manufacturers offering boiler economizers which may be incorporated in the work include, but are not limited to, the following:

- A. Kentube; Dlr. of Tranter, Inc.

### 3.0 - EXECUTION

#### 3.1 INSPECTION:

- A. Examine areas and conditions under which boiler accessories are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

#### 3.2 INSTALLATION OF BOILER ACCESSORIES:

- A. Install boiler accessories as indicated, in accordance with manufacturer's installation instructions, and with recognized industry practices, to ensure that boiler accessories comply with requirements and serve intended purposes. Comply with requirements of state and local boiler codes, applicable portions of ASME Boiler and Pressure Vessel Code, and applicable portions of ASME B31.1 or ASME B31.9.

3.2.1 Coordinate with other work as necessary to interface installation of boiler accessories with other components of heat generation systems.

#### 3.3 BOILER VALVES:

3.3.1 Stop-and-Check-Valves: Install as indicated on top of boiler steam nozzles. Install additional chain operated stop valve between stop-and-check valve and boiler header.

3.3.2 Y-Type Blowdown Valves: Install as indicated on blowdown piping. Connect discharge to blowdown separator. Install additional stop valve between blowdown valve and boiler.

#### 3.4 SAFETY AND VALVES:

3.4.1 Steam Safety Valves: Install as indicated on top of boilers. Pipe discharge to floor drain for low-pressure service. Pipe discharge to outdoors for high-pressure service, pipe drain outlets of drip pan elbow to floor drain. Pipe drain outlets of exhaust heads full size to floor drain or sewer.

3.4.2 Water Relief Valves: Install as indicated on top of boilers. Pipe discharge to floor drain.

#### 3.5 BOILER BLOWDOWN SEPARATORS:

3.5.1 General: Install boiler blowdown separators as indicated, on concrete pad. Connect drain to sewer, and vent to outdoors. Connect boiler blowdown inlet piping, and cold water supply piping with shutoff valve, strainer, and temperature regulator valve. Install temperature regulator valve bulb and thermometer in thermometer wells in blowdown separator discharge.





3.6 BOILER WATER TREATMENT FEEDERS:

- 3.6.1 One-Shot Feeders: Install as indicated on vertical section of boiler water feed line, as close to boiler as practical. Connect feed piping to inlet and outlet connections with shutoff valves. Pipe drain valve discharge to floor drain.
- 3.6.2 Bypass Feeders: Install as indicated, with supply and return connected to 2 tees in boiler water feed line. Connect feed piping to inlet and outlet connections with shutoff valves. Pipe drain valve discharge to floor drain.
- 3.6.3 Treatment Feeders: Install as indicated with solution tank and pump on concrete pad. Provide cold water connection and shutoff valve to top of tank, connect pump discharge piping to boiler water feed line.

3.7 BOILER ECONOMIZERS:

- 3.7.1 Install as indicated, and in accordance with manufacturers installation instructions. Pipe header drains to floor drain.

3.8 FIELD QUALITY CONTROL:

- 3.8.1 Flush and clean boiler accessories upon completion of installation, and in accordance with manufacturer's installation instructions.
- 3.8.2 Hydrostatically test, if required, assembled boiler accessories and piping In accordance with applicable sections of ASME Boiler and Pressure Vessel Code. ;

END OF SECTION 15639a



## SECTION 15639b

### BOILER FEEDWATER EQUIPMENT

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of boiler feedwater equipment. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.1 Submittals:
- A. Product Data: Submit manufacturer's technical product data, including rated capacities of selected model clearly indicated, current accurate pump characteristic performance curves with selection points clearly indicated, weights (shipping, installed, and operating where applicable), furnished specialties and accessories; and installation and start-up instructions.
  - B. Shop Drawings: Submit manufacturer's assembly-type shop drawings indicating dimensions, weight loadings, require clearances, and methods of assembly of components.
  - C. Wiring Diagrams: Submit manufacturer's ladder-type wiring diagrams for electrically operated feed water equipment. Differentiate between portions of wiring that are factory-installed and portions to be field-installed.
  - D. Maintenance Data: Submit maintenance data and parts lists for each feed water equipment item, including "trouble-shooting" maintenance guide. Include this data, product data, shop drawings, and wiring diagrams in maintenance manual; in accordance with requirements of the Contract.
- 2.0 PRODUCTS :
- 2.1 Specialty Components and Parts shall be in accordance with applicable requirements of the ASME Boiler and Pressure Vessel Code.
- 2.2 Welding and Brazing Materials shall be as specified in Section II of the ASME Boiler and Pressure Vessel Code.
- 3.0 EXECUTION:
- 3.1 Repairs shall be accomplished with either the entire feedwater-system or applicable portions isolated from service and drained.
- 3.2 All Isolation Valves shall be secured in the closed position, all drain valves secured in the open position, and pumps rendered inoperative before and during repairs to the aerators, softeners, and chemical feeders.
- 3.3 Welding shall be performed in accordance with Section IX of the ASME Code.
- 3.4 Electrical Work shall comply with the requirements of NFPA 70.
- 3.5 Drive Train Components shall be repaired or replaced to transmit power free from vibration at the required torque.



- 3.6 Repair Procedures for receiver vessels shall provide structural integrity as specified in NBBI NB-23.
- 3.7 Feed Pump Control and Low Water Cut-Off:
- 3.7.1 Each oil fired boiler shall be equipped with a combined feed pump control and low water cut-off device installed on the boiler, which shall maintain a safe boiler water level by automatically opening a motorized valve which shall start the boiler feed pump whenever the water in the boiler drops to the minimum safe level. The device shall also stop the oil burner from operating should the water drop below the minimum safe level. All electric relays and wiring required for the proper installation and functioning of the boiler feed water system shall be furnished and installed by this Contractor.
- 3.7.2 The feed pump control and low water cut-off shall be complete with an alloy metal float, magnetic switches, linkage, etc. contained in a cast iron or semi-steel housing, all factory assembled and shall be designed to operate on 120 volts AC. The control shall be mounted on the boiler in the location shown on the drawings. Feed pump control and low water cut-off shall be No. 93-5 manufactured by McDonnell & Miller, Inc., or other approved equal.
- 3.8 Secondary Low Water Cut-Off
- Furnish and install on each oil-fired boiler, in the location indicated on the drawing, a secondary low-water cut-off with manual reset. Secondary low water cut-off shall be set to function at a level approximately 1/2-inch lower than the operating level of the primary cut-off specified in Para. 3.7.2. It shall interrupt the oil burning process should the water level in the boiler drop below a safe level without actuating the primary cut-off. The secondary low water cut-off shall be so designed that electric power will not be restored to the oil burner until the manual reset button, located on the cut-off, has been activated.
- 3.8.2 Control shall be the electric probe type, designed for 120-volt operation. It shall be UL approved and shall be the equal of Hydrolevel Corp.'s Model LC967, installed in a Model LC1214-2 manifold. Control shall be installed complete with all necessary switches, relays, wiring, etc. Submit shop drawing for approval.
- 3.9 Motor Operated Boiler Feed Valves
- Furnish and install in the feed water piping to each boiler, in the location shown on the drawing, a motor operated valve which will be actuated by the feed pump control and low water cut-off specified in Para. 3.7.2. The motor operated valve shall be equipped with an auxiliary switch which, through a relay, shall cause the feed pump to start when the valve is open and shall cause the feed pump to stop when the valve begins to close. Power supply to valve shall be wired to load side of feed pump disconnect switch.
- 3.10 Tests:
- A. Boiler feed pumps and water shall be tested for operating characteristics and the report of these tests, performance and required not positive suction head curves shall be submitted to the Contracting Officer for approval.
- B. Vacuum pumps shall be tested by the manufacturer at his factory in accordance with the latest ASHRAE "Standard Code for Testing and Rating Return Line Vacuum Heating Pumps".
- 3.11 Field Quality Control:



## 15000 - Mechanical

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- A. General: Start-up feedwater equipment, in accordance with manufacturer's start-up instructions. Test controls and demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.
- B. Test:
  - 1. Contractor shall submit in duplicate for approval certified air and water capacities based upon tests of the pumps made by the manufacturer so that the capacity of each pump can be verified after installation of the equipment at the site by similar tests which shall be made by the Contractor under the direction of the manufacturer of the pumps when directed by and in the presence of a representative of the Contracting Officer. This contractor shall provide and connect all equipment necessary for the proper conducting of this test.
  - 2. During the test of the entire installation, the vacuum pumps shall be tested as follows:
    - a. With all valves open and with no steam on the system, the vacuum pump shall raise a vacuum of at least 20-inches of mercury measured at the gauge at the pump not operating for one hour, the loss of vacuum shall not exceed 3-inches of mercury.
    - b. With the pumps operating alternately, and with steam on the entire system, the pumps shall each maintain a vacuum of 5 1/2-inches of mercury, as indicated by gauge on receiving tank at pumps. Steam pressure at boiler shall not exceed two pounds gauge pressure.
    - c. The above tests shall take place in the presence of the Contracting Officer. The Contractor shall give 48-hours notice in advance of this test.

END OF SECTION 15639b



## SECTION 15639c

### CLEANING OF BOILERS

- 1.0 DESCRIPTION OF WORK: This specification covers cleaning of boilers. Products and materials used shall be in accordance with the boiler manufacturer's recommendations and/or shall be as directed by the Contracting Officer. Cleaning procedures shall be developed by the Contractor and shall be in accordance with the boiler manufacturer's recommendations, Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
- 2.1 Equipment required for cleaning, such as acid feed tank and pump, alkaline feed tank and pump, mixer, neutralizer tank and pump, power brushes, high pressure sprays, and other equipment shall be supplied by the Contractor.
- 2.2 Chemical Cleaning Materials:
- 2.2.1 Boilout Chemicals shall be trisodium phosphate complying with ASTM D 538, caustic soda complying with ASTM D 456, and soda ash complying with ASTM D 458.
- 2.2.2 Acid Cleaning Chemicals shall be:
- Hydrochloric Acid
  - Ammonium Bifluoride,  $N_2H_4F_2$
  - Hydroxycetic Acid,  $CH_2OHCOOH$ , Technical Grade
  - Formic Acid,  $HCOOH$ , Technical Grade
  - Phosphoric Acid
  - Sulfuric Acid
  - Sulfamic Acid,  $HSO_3NH_2$
- 2.2.2 Neutralizing-Passivating Chemicals shall be as follows:
- Monosodium Phosphate,  $H_2NaO_4P$
  - Di-sodium Phosphate,  $Na_2HPO_4$
  - Ammonia, Anhydrous,
  - Hydrazine, Anhydrous,  $H_2NNH_2$
  - Sodium Sulfite
  - Sodium Nitrate
- 2.2.4 Flushing Water shall be demineralized water with a conductivity end point of 50 micro-ohms.
- 2.2.5 Pressure Craingin Gas shall be commercially pure, 99.5 percent nitrogen.
- 2.3 Mechanical Cleaning Materials and Equipment:



## 15000 - Mechanical

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- 2.3.1 Brushes shall be of the type for use with power units.
- 2.3.2 Washwater shall be hot alkaline washwater for removing ash deposits.
- 3.0 EXECUTIONS:
  - 3.1 Clean Boilers: of all scale and deposits.
  - 3.2 Inspection: After cleaning, the boiler shall be given a visual inspection for effectiveness of scale removal.
  - 3.3 Welding and Burning: No welding or burning shall be allowed during cleaning operations.
  - 3.4 Alkaline Boilout:
    - 3.4.1 Boilout Chemicals shall be completely dissolved in water before being introduced into the boiler.
    - 3.4.2 Boilout chemicals shall be completely dissolved in water before being introduced into the boiler.
    - 3.4.3 Boilout Pressure shall be operating pressure for boilers operating at 200 psig and less. For boilers operating at above 200 psig, the boilout pressure shall be 200 psig or one-half the operating pressure, whichever is higher. In no case shall boilout pressure exceed 600 psig.
    - 3.4.4 Concentration of Chemicals and duration of boilout will be dependent upon the scale analysis. Boilout time may vary from 8 to 24 hours with boiler water solids purged by blowdown at approximately 4-hour intervals.
    - 3.4.5 Flush Unit with demineralized water until the effluent is clear of visible solids.
  - 3.5 Acid Cleaning, using either the circulating or soaking method, shall be done in the following sequence:
    - A. Wash heating surfaces with an acid solvent containing a proper inhibitor.
    - B. Flush unit with clean water.
    - C. Neutralize and passivate the unit.
    - D. Flush the unit with clean water.
  - 3.6 Circulating Method:
    - 3.6.1 Acid application: Acid cleaning time shall vary from a minimum of 4 hours, depending on scale analysis. Time shall be determined by analyzing samples of return solvent for iron concentration and acid strength.
    - 3.6.2 Flushing: After cleaning, flush unit with demineralized water until pH reaches 6.5.
    - 3.6.3 Neutralization: After flushing, neutralize the unit with ammonia and hydrazine for 2 hours at 200 F.
    - 3.6.4 Final Flush: Final flush with demineralized water until pH reaches 7.5.
  - 3.7 Soaking Method:
    - 3.7.1 Application: Acid cleaning time shall vary from 4 to 8 hours depending on scale analysis. For soft sludges, cleaning time shall be a minimum of 4 hours. Cleaning time shall be 6 hours for thin coatings of hard scale. For heavy deposits, cleaning time shall be a maximum of 8 hours. The time periods



## 15000 - Mechanical

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noted are actual retention time of the solvent in the unit, including the time of filling and draining. Unit shall be drained under nitrogen pressure.

- 3.7.2 Flushing: After required cleaning time, flush unit with demineralized water.
- 3.7.3 Neutralizing: After flushing, the unit shall be neutralized and passivated with a solution of soda ash and boiled out for a period of 4 to 6 hours. The boilout pressure shall be operating pressure for boilers operating at 200 psig and less. For boilers operating at above 200 psig, the boilout pressure shall be 200 psig or one-half the operating pressure, whichever is higher. In no case shall boilout pressure exceed 600 psig.
- 3.7.4 Final Flush: After boilout, the unit shall be drained and flushed with demineralized water containing sodium nitrate, until the pH reaches 7.5.
- 3.8 Effluent Neutralization: The solvent effluent drained from the unit shall be neutralized with caustic soda or soda ash to a pH of 6.8 to 8.5.

END OF SECTION 15639c



## SECTION 15639d

### FIREBRICK FIREBOXES FOR BOILERS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for repair and maintenance of fire brick fireboxes for boilers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
  - 2.1 Replacement Parts and Materials for pressure parts, or for attachment to pressure parts, shall comply with requirements of the ASTM Boiler and Pressure Vessel Code for new construction.
  - 2.2 The Following Refractory Materials shall comply with the requirements of Section 15281: fire brick, refractory tile, plastic refractory, castable refractory, and refractory mortar.
- 3.0 EXECUTION:
  - 3.1 Repair and Maintenance Work shall be performed in accordance with procedures developed by the Contractor that are in compliance with requirements of the ASME Boiler and Pressure Vessel Code and have been approved by the Contracting Officer.
  - 3.2 No Personnel shall enter the boiler until it has been removed from service, cooled, drained, and purged, and the atmosphere in the boiler has been checked with a Burrell or other suitable instrument and found to be free of toxic, explosive, or suffocating gases.
  - 3.3 Fire Tube Boilers:
    - 3.3.1 When Replacing Burner Throat Tile, maintain correct throat diameter and ensure that throat is centered in the furnace.
    - 3.3.2 Repair Burner Throat and Furnace Liner Tile Cracks with high temperature bonding mortar.
    - 3.3.3 Wash Coat Burner Throat and Furnace Liner Tile with high temperature bonding mortar diluted with water.
    - 3.3.4 Patch Cracks, 1/8 inch and larger in width, with high temperature bonding mortar or high temperature plastic refractory.
    - 3.3.5 Patch Gap between castable refractory and baffle tile with high temperature plastic refractory.
    - 3.3.6 Patch Damaged Rear Door Refractory with castable refractory.
  - 3.4 Watertube Boilers: Repair cracks with ceramic fiber. Apply wash coat to burner throat.
  - 3.5 Closing the Boiler: Repairs shall not be covered by replaced or reinstalled materials until authorized.
  - 3.6 Drying Out:





3.6.1 Air Dry: Allow refractory to air dry as long as possible.

3.6.2 Fire Dry: To thoroughly dry refractory by firing, fire boiler intentionally be low rate.

END OF SECTION 15639d



## SECTION 15639e

### FIREBRICK FOR INSULATION OF BOILER FIREBOXES

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of firebrick for insulation of boiler fireboxes. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
- 2.1 Replacement Parts and Materials for attachment to pressure parts of the boiler shall comply with requirements of the ASME Boiler and Pressure Vessel Code for new construction.
- 2.2 Firebrick, Plastic Refractory, Castable Refractory, and Refractory Mortar shall conform to the requirements of Section 15281.
- 3.0 EXECUTION:
- 3.1 No Personnel shall enter the boiler until it has been removed from service, cooled, drained, purged, and the atmosphere in the boiler has been checked with a Burrell or other suitable instrument and found to be free of toxic, explosive," or suffocating gases.
- 3.2 Repair and Maintenance Work shall be performed in accordance with procedures in compliance with requirements of the ASME Boiler and Pressure Vessel Code and the NBBI National Board Inspection Code, and approved by the Contracting Officer.
- 3.3 Closing the Boiler: Repairs shall not be covered by replaced or reinstalled materials until authorized.
- 3.4 Drying Out: Allow refractory to dry as long as possible.

END OF SECTION 15639e



## SECTION 15645a

### OIL-FIRED AND GAS-FIRED BURNERS FOR BOILERS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of oil-fired and gas-fired burners for boilers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
  - 2.1 Oil-Fired Burner Pipe, Tubing, Fittings, Flanges, Valves, and Gaskets shall comply with the requirements of ANSI B31.1.
  - 2.2 Gas-Fired Burner Pipe, Tubing, Fittings, Flanges, Valves, and Gaskets shall comply with the requirements of ANSI B31.2.
  - 2.3 Burner and Pilot System and Combustion and Safety Controls shall comply with the requirements of ANSI/NFPA 85A, 85B, or 85D.
  - 2.4 Electrical Devices: Electrical equipment, control relays, devices, wiring, and enclosures shall comply with the requirements of ANSI C1.
- 3.0 EXECUTION:
  - 3.1 No Personnel shall enter the boiler until it has been removed from service, cooled, purged and the atmosphere in the boiler has been checked with a Burrell or other suitable instrument and found to be free of toxic, explosive, or suffocating gases.
  - 3.2 Before Welding, Brazing, or Cutting, gas piping shall be purged and the atmosphere checked and found to be free of an explosive gas mixture.
  - 3.3 Oil-Fired Burner Repairs: All oil-fired burners, equipment, and control repairs shall be accomplished in compliance with ANSI B31.1 and C1, ANSI/NFPA 85A or 85D. All welding of piping shall comply with the welding procedures and qualifications of ANSI B31.1.
  - 3.4 Gas-Fired Burner Repairs: All gas-fired burners, equipment, and control repairs shall be accomplished in compliance with ANSI B31.2 and C1, ANSI/NFPA 85A or 85B. All welding of piping shall comply with the welding procedures and qualifications of ANSI B31.2.
  - 3.5 Inspection and Testing:
    - 3.5.1 Leak Test all piping.
    - 3.5.2 Pressure Test all piping in compliance with ANSI B31.1 for oil-fired burners or ANSI B31.2 for gas-fired burners.
    - 3.5.3 Performance tests are required on the completed fuel oil burning installation.



## 15000 - Mechanical

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- 3.6 Drawings: Drawings of the proposed oil burner installation showing the arrangement of the burners, piping, wiring, pumps and accessories shall be submitted and approved before installation is started. In addition, shop drawings of the following equipment shall also be submitted for approval: burners, pumps, heaters, tanks, inducers, strainers, valves, gauges, thermometers, damper motors, indicating instruments and safety devices.
- 3.7 Piping and Wiring Diagram: A complete wiring diagram and piping layout of the oil burner system shall be framed and mounted where directed in the Boiler Room. Frame shall be of aluminum, satin finish, with one side of frame removable, and with a plywood backing. Single thick glass front shall be provided. All parts of the installation shall be indicated exactly as installed and shall be properly identified. Valve identification numbers shall agree with valve tags, and all piping shall be clearly shown.

END OF SECTION 15645a



## SECTION 15645b

### COAL-FIRING SYSTEMS FOR BOILERS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of coal-firing systems for boilers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCT:
  - 2.1 Coal-Firing System Equipment and Materials shall comply with the requirements of ANSI B31.1, ASME Boiler and Pressure Vessel Code Section II, and NFPA 60.
  - 2.2 Burner and Pilot System and Combustion and Safety Controls shall comply with the requirements of ANSI/NFPA 85E.
  - 2.3 Electrical Devices: Electrical equipment, control relays, devices, wiring, and enclosures shall comply with the requirements of ANSI CI and NFPA 70.
- 3.0 EXECUTION:
  - 3.1 No Personnel shall enter the boiler until it has been removed from service, cooled, purged, and the atmosphere in the boiler has been checked with a Burrell or other suitable instrument and found to be free of toxic, explosive, or suffocating gases.
  - 3.2 Before Welding, Brazing, or Cutting, coal piping shall be purged and the atmosphere checked and found to be free of an explosive coal/air mixture.
  - 3.3 Coal-Fired Burner Repairs: All coal-fired burners, equipment, and control repairs shall be accomplished in compliance with ANSI B31.1 and CI, ASME Code Section II, NFPA 60, and ANSI/NFPA 85E. All welding of piping shall comply with the welding procedures and qualifications of ANSI B31.1 and ASME Code Section IX.
  - 3.5 Testing: Leak test all piping. Pressure test all piping in compliance with ANSI B31.1 and ASME Code Section II.

END OF SECTION 15645b



## SECTION 15645c

### GAS UNIT HEATERS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of gas unit heaters. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
  - 2.1 New Unit Heater shall comply with AMCA 99 and 210, AGA Directory of Certified Appliances and Accessories; NEPA 70; and UL Electrical Construction Materials List and UL 795.
  - 2.2 Heat Exchangers shall be fabricated from steel complying with ASTM A 569 to form a unitized, multi-section type heat exchanger and combustion chamber for each burner.
  - 2.3 Burners shall be of a corrosion-resistant steel with unitized rows of burners to provide one burner per heat exchanger section and shall have crossover igniter to provide positive ignition of each burner row.
  - 2.4 Housings shall be fabricated from sheet steel of a thickness to provide sufficient strength to ensure rigidity and shall include a flue connection. The housing shall be provided with means for suspension or floor mounting as required.
  - 2.5 Fans shall be the propeller type, fabricated of aluminum or steel, dynamically balanced, and direct motor driven. Fan motors shall be totally enclosed type, and built-in thermal overload protection shall be provided for single-phase motors.
  - 2.6 Controls:
    - 2.6.1 Thermal Limit Control shall be provided to shut off gas supply in the event normal operating temperatures are exceeded.
    - 2.6.2 Fan Delay Switch shall be provided for continuous fan operation after burner shutdown until heat exchanger temperature is reduced to prevent excessive heat build-up.
    - 2.6.3 Gas Valve with Safety Shutoff and Manual Main Shutoff shall be provided with automatic pilot and shall automatically regulate gas pressure and, in the event of flame failure, shall cause safety shutdown of burner.
    - 2.6.4 Thermostat shall be wall-mounted, heavy-duty type with enclosed contacts, with a 3-position selector switch to permit manual fan operation independent of temperature control. Control circuit voltage shall not exceed 30 volts as provided by a factory-installed control circuit transformer.
- 3.0 EXECUTION:
  - 3.1 Welding shall be in compliance with AWS D1.1.
  - 3.2 Brazing shall be in compliance with ASME Code Section IX.



3.3 Damage to Galvanized Coatings shall be repaired by applying galvanizing repair paint.

END OF SECTION 15645c



## SECTION 15645d

### OIL UNIT HEATERS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of oil unit heaters. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
  - 2.1 New Unit Heaters shall comply with AMCA 99 and 210, AGA Directory of Certified Appliances and Accessories; NFPA 70; UL Electrical Construction Materials List; and UL 296.
  - 2.2 Heat Exchangers shall be of corrosion-resistant steel and shall include a combustion chamber (primary heating surface) and a heat exchanger (secondary heating surface).
  - 2.3 Burners shall be the high pressure or low pressure atomizing type. The burner shall be completely automatic and shall incorporate an oil pump, burner motor, combustion air fan, burner tube, and automatic ignition.
  - 2.4 Housings shall be fabricated from sheet steel of a thickness to provide sufficient strength to ensure rigidity. The housing shall be provided with means of suspension. Housing shall include a flue connection.
  - 2.5 Fan shall be the propeller type fabricated of aluminum or steel.
- 2.6 CONTROLS:
  - 2.6.1 Thermal Limit Control shall be provided to shut off oil supply in the event normal operating temperatures are exceeded.
  - 2.6.2 Fan Delay Switch shall be provided for continuous fan operation after burner shutdown until heater exchanger temperature is reduced to prevent excessive heat build-up.
  - 2.6.3 Thermostat shall be unit- or wall-mounted and shall be heavy duty type with enclosed contacts, with a 3-position selector switch to permit manual fan operation independent of temperature control. Control circuit voltage shall not exceed 30 volts as provided by a factory- installed control circuit transformer.
- 3.0 EXECUTION:
  - 3.1 Welding and Brazing shall be in compliance with AWS D1.1.
  - 3.2 Damage to Galvanized Coatings shall be repaired by applying galvanizing repair paint.

END OF SECTION 15645d





## SECTION 15650

### REFRIGERANT EQUIPMENT

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of refrigerant equipment. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.1 Rules, Permits, Etc.: Permits necessary for work in connection with the installation of the refrigeration equipment and the operation thereof shall be obtained by this Contractor, free of charge to the Contracting Officer from all municipal agencies having jurisdiction. Work and materials ( including the installation of instruction signs) shall conform with the latest requirements of these departments. Contractor's attention is directed to the requirements of the current edition of the Building Code.
- 2.0 PRODUCTS :
  - 2.1 Performance Ratings: The performance rating of each item of the new refrigerant equipment furnished shall comply with the applicable portions of ARI Standards 450, 460, 495, and 590.
  - 2.2 Bearings shall be an exact replacement. Bearing life shall be equal to the bearing to be replaced.
    - 2.2.1 Bearings for reciprocating equipment shall be precision, oil-cooled or babbitted type.
    - 2.2.2 Bearings for centrifugal equipment or rotary screw equipment shall be precision, oil-cooled type.
- 3.0 EXECUTION:
  - 3.1 Welding: All welding shall be in compliance with AWS D1.1.
  - 3.2 Damage to Galvanized Coatings shall be repaired by application of galvanizing repair paint.
  - 3.3 Controls:
    - 3.3.1 Chiller Controls: Replace, adjust, and recalibrate defective parts and assemblies.
    - 3.3.2 Starter Controls: Replace defective contactors and relays as necessary.
    - 3.3.3 Capacity Controls: Adjust guide vane linkages and actuator control in compliance with the manufacturer's specification.
  - 3.4 Non-condensables: Check accumulation rate of non-condensables in absorption refrigerant equipment for compliance with manufacturer's instructions.
  - 3.5 Installation and Adjustment:
    - A. Refrigeration equipment shall be installed under the direction of the manufacturer's representative. All adjustments, alterations, etc., necessary to make the apparatus fully operative for the purposes intended, shall be made.



## 15000 - Mechanical

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- B. The manufacturer shall furnish the services of a factory trained representative for a total of two consecutive normal working days to supervise the pressure testing, evacuation (if other than R-22 is used for pressure testing) charging, and initial start-up of the unit, and to concurrently instruct the Contracting Officer. He shall also deliver to the Contracting Officer at this time a complete written set of installation and operating instructions, a copy of which shall be submitted with the shop drawings.
- 3.6 Drawings: A complete system layout drawings indicating all piping, wiring, accessories, etc., required for the particular equipment installed, together with complete details and drawings of chiller, compressor, air-cooled condenser assembly, pressure vessels, regulating valves, strainers, etc., shall be submitted and approved before installation. Layout drawings shall have received prior approval of the manufacturer and such approval shall be indicated on the drawing.
- 3.7 Piping and Wiring Diagrams: A complete wiring diagram and a piping layout for the system shall be framed and mounted where directed in the Equipment Room. All parts of the installation shall be indicated exactly as installed and properly identified. Valve identification numbers shall agree with valve tags and all piping shall be plainly marked on drawings. See Section 15100 Par 3.9. Shop drawings shall not be provided with valve identification numbers. Frame shall be of aluminum, satin finish, with one side of frame removable, and with a plywood backing. Single thick glass front shall be provided.
- 4.0 EQUIPMENT GUARANTEE AND INSPECTION:
  - 4.0.1 The Contractor shall guarantee the equipment including controls, for a total period of two (2) years from the date of initial start-up of the system. The guarantee shall include the parts, including refrigerant, and labor to inspect, repair and adjust all components of the chiller and air cooled condenser installation. Inspections, repairs and adjustments shall be performed by mechanics employed by the manufacturer or by his authorized service representative.
  - 4.0.2 Inspections and Adjustments: Four regular inspection and service calls shall be made each year. One call shall be made at start-up . another at season shutdown, and the other two calls shall be made at equally spaced intervals during the cooling season. Each regular inspection call shall include the following services:
    - A. Check refrigerant charge and add, as required.
    - B. Check oil level in each compressor crankcase, and bring to proper level as required.
    - C. Check all temperatures and pressures. Adjust as required to comply with manufacturer's standards.
    - D. Check all operating and safety controls. Adjust or replace any control that does not function in accordance with manufacturer's specifications.
    - E. Check each condenser and each evaporator coil.
    - F. Check and adjust belts for proper tension and alignment. Clean as required.
    - G. Lubricate equipment as required.
    - H. Annually, drain crankcase, clean sump, replace filter and refill with proper oil as recommended by manufacturer.



## 15000 - Mechanical

- 4.0.3 Emergency Service Calls: In addition to the four regular inspection calls specified in sub-paragraph 4.1.2, emergency calls shall be made on demand when malfunction occurs.
- 4.0.4 Reports: At the conclusion of each visit, the service representative shall deliver to the Contracting Officer's representative, a written report of the services he has performed and any additional work that is required or recommended.
- 4.0.5 Repairs: The manufacturer (or his authorized service representative) shall perform all required repairs on the specified refrigeration equipment without additional cost to the Contracting Officer. Repairs shall include, but not be limited to, the following, except where otherwise excluded by sub-paragraph 4.1.6:
- A. Furnish all supplies, replacement parts, refrigerant and labor. This includes heat exchangers and tubes.
  - B. Maintain insulation on the refrigerant piping and equipment as supplied by the manufacturer.
  - C. Maintain pressure and temperature controls, thermometers, gauges, control devices, thermostats and manual valves as supplied by the manufacturer and located at equipment.
  - D. Motor starters supplied in the original equipment.
  - E. Compressors and condensers.
  - F. Steam clean condensers and evaporator coils when required.
- 4.0.6 Exclusions: The inspections, service, maintenance and repair called for under this paragraph do not include the following:
- A. Normal daily and weekend functions of stopping and starting the refrigeration equipment covered hereunder. Replacement of fuses. Operation of reset buttons.
  - B. The guarantee of room conditions or (air conditioning) system performance unless improper conditions are directly due to the failure of the mechanical equipment covered hereunder.
  - C. Piping, other than refrigerant piping.
- 4.0.7 The guarantee time shall begin when the refrigeration equipment is initially started (as specified) in Par. 3.5 and shall expire two (2) calendar years after that date. The HVAC Contractor shall give written notice to the Contracting Officer at least two days before the initial start-up.
- 4.0.8 The Contractor shall submit with his application for payment, at time of initial start-up, three (3) copies of the guarantee issued by the manufacturer of the refrigeration equipment or his authorized service representative.
- 4.1 The Equipment manufacturer shall indicate on his shop drawings that the sequence of operation specified herein conforms, in general, with his recommended operating procedure.
- 4.2 Contractor for Heating and Ventilating shall provide and install all wiring, relays, contactors, accessories, etc., required to permit the control systems to function as specified. Wiring, conduit, etc. shall be installed in accordance with the applicable building codes. Submit shop drawings of control systems for approval.
- 4.3 Operating Instructions: Provide and install where directed in the Equipment Room in the vicinity of the Equipment, an engraved instruction plate with 1/4-inch (minimum size) letters. Plate shall be 1/8-inch



## 15000 - Mechanical

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thick white core plastic laminate with beveled edge. It shall be secured to wall with "Miracle Adhesive", or approved equal. Instruction plate shall bear a legend recommended by the manufacturer.

END OF SECTION 15650



## SECTION 15661

### CONDENSERS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of condensers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
  - 2.1 Air-Cooled Condensers:
    - 2.1.1 Furnish and install remote, vertical discharge air cooled condensers of capacity and size shown on the drawings. Each condenser shall be complete with condenser coil, fans, motors and controls contained in a casing of No. 16-gauge (minimum) steel. Casing shall have a phosphatized, or approved equal, treatment and shall be furnished with two coats of alkyd enamel or other approved corrosion resistant paint. Aluminum casing of not less than No. 12-gauge also is acceptable. Provide access panels to motors, drives and coil connections.
    - 2.1.2 Coils shall be made either of all aluminum or of copper tubes with mechanically bonded aluminum fins. Coils shall be factory leak tested, dehydrated and shipped with a positive dry holding charge.
    - 2.1.3 Each condenser shall be equipped with propeller type fans, either direct or belt driven. Direct drive fans shall have aluminum blades with zinc coated steel hub and shaft. Belt driven fans shall have zinc plated steel blades with iridite dip, and shall be equipped with lubricated pillow block ball bearings. Motors shall be drip-proof type and shall be provided with thermal overload protection. Fan discharge shall be fitted with close mesh electrogalvanized or aluminum fan guard.
    - 2.1.4 Each condenser shall be installed in the location shown on the drawings. The condenser shall be installed with legs field welded or bolted to structural crossmembers provided by this Contractor. Crossmembers shall be sized to carry the load imposed by the fully charged condenser, and shall have the minimum dimensions of 8WF 13 beams. Crossmembers shall be field welded or securely bolted by this Contractor to structural base provided by others. Painting of crossmembers will be done by others.
    - 2.1.5 Each condenser fan motor shall be provided with a combination starter and disconnect with fuse protection required by distribution. Starter-disconnect shall be contained in a weatherproof NEMA enclosure, mounted on the condenser.
    - 2.1.6 Refrigerant Piping shall be hard drawn copper, Type L, refrigeration grade complying with ASTM B 75. Valves shall be of brass construction, diaphragm packless or back seating type, specifically designed for refrigeration service.
    - 2.1.7 Air cooled condensers manufactured by Bohn Heat Transfer Div. of Gulf & Western Industries, Carrier corp., Dunham-Bush, Inc. McQuay-Perfex inc., Trane Co. or York Div. of Borg-Warner Corp. and complying with the requirements of the drawings and specifications will be approved.



## 15000 - Mechanical

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### 2.2 Water-Cooled Condensers:

2.2.1 New Condensers shall be of shell-and-tube construction. The condenser shall be designed, fitted, and rated in compliance with the recommendations and requirements of ARI 450, ASHRAE 22, and UL 207. The condenser shall be constructed in compliance with Section VIII of ASME Boiler and Pressure Vessel Code.

2.2.2 Refrigerant Receiver shall comply with Sections II and VIII of the ASME Boiler and Pressure Code.

2.2.3 Condenser materials for repairs shall be in compliance with Section II of the ASME Boiler and Pressure Vessel Code.

2.2.4 Condenser Tubes shall be fabricated of seamless copper tubing with integral fins, and the tubes shall be individually replaceable and rolled or brazed into the tube sheets of the shell-and-tube unit. The entire bundle shall be removable on shell-and-coil units.

### 3.0 EXECUTION:

3.1 Condensers shall be repaired and retested in compliance with Section VIII of the ASME Boiler and Pressure Vessel Code.

3.2 Condenser Tubes shall be repaired and retested in compliance with Section VIII of the ASME Boiler and Pressure Vessel Code.

3.3 Welding and Brazing shall be performed in compliance with AWS D1.1 and Section IX of the ASME Boiler and Pressure Vessel Code.

3.4 Damage to Galvanized Coatings shall be repaired by application of galvanizing repair paint.

END OF SECTION 15661



## SECTION 15674

### CENTRIFUGAL CHILLERS - WATER COOLED

#### 1.0 - GENERAL

##### 1.1 SUMMARY:

- A. This Section specifies packaged, water cooled, hermetic centrifugal water chillers.

OR

This Section specifies packaged, water cooled, hermetic centrifugal water chillers, with auxiliary heat recovery condenser unit.

- B. This Section specifies the installation requirements for the Corpus Christi Army Depot furnished centrifugal water chillers. Refer to Division 1 for requirements for Corpus Christi Army Depot furnished equipment.

##### 1.2 SUBMITTALS:

- 1.2.1 Product Data: Submit product data, including rated capacities, weights (shipping, installed, and operating), furnished specialties and accessories; and installation and start-up instructions.

- 1.2.2 Drawings: Submit manufacturer's assembly type shop drawings indicating dimensions, weight loadings, required clearances, methods of assembly of components, and location and size of each field connection.

- 1.2.3 Wiring Diagrams: Submit manufacturer's electrical requirements for power supply wiring to units. Submit manufacturer's ladder type wiring diagrams for interlock and control wiring. Clearly differentiate between portions of wiring that are factory-installed and portions to be field installed.

- 1.2.4 Maintenance Data: Submit maintenance and operating data. Include this data in maintenance manual in accordance with requirements of Division-1 and Section 15010.

##### 1.2.5 Quality Control Submittals:

- A. Submit certification of compliance with ASME, UL, AND ASHRAE fabrication requirements specified in Quality Assurance below.
- B. Submit certification of compliance with performance verification requirements specified in PART 2 of this Section.
- C. Submit quality control reports specified in PART 3 of this Section.

##### 1.3 QUALITY ASSURANCE:

- 1.3.1 Manufacturer's Qualifications: Firms regularly engaged in manufacture of centrifugal chillers, of types and capacities required, whose products have been in satisfactory use in similar service for not less than 5 years.



## 15000 - Mechanical

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- 1.3.2 Machine Experience: At time of submission of bid or proposal, chiller model proposed must have acquired minimum of 2 years experience on each of 10 field installations, each machine having acquired minimum of 2,400 operating hours.
- 1.3.3 Regulatory Requirements:
  - A. ASHRAE Compliance: Fabricate and install centrifugal chillers to comply with ASHRAE 15 "Safety Code for Mechanical Refrigeration".
  - B. UL Compliance: fabricate centrifugal chillers to comply with UL 465 "Central Cooling Air Conditioners".
  - C. ASME Compliance: fabricate and stamp centrifugal chillers to comply with ASME Boiler and Pressure Vessel Code, Section VIII, Division 1.
- 1.4 DELIVERY, STORAGE, AND HANDLING:
  - 1.4.1 Deliver chillers as a complete factory-assembled unit with protective crating and covering.
  - 1.4.2 Ship chillers in a deep vacuum in one of two pieces, depending upon size.
  - 1.4.3 Coordinate the delivery of the chiller(s) in sufficient time to allow movement into the building.
- 1.5 SEQUENCING AND SCHEDULING:
  - 1.5.1 Coordinate the size and location of concrete equipment pads. Cast anchor bolt inserts into pad.
  - 1.5.2 Concrete, reinforcement, and formwork requirements are specified in Division 3.

## 2.0 - PRODUCTS

- 2.1 MANUFACTURERS:
  - 2.1.1 Available Manufacturers: Subject to compliance with requirements, provide centrifugal chillers from one of the following:
    - A. Carrier A/C Group;
    - B. Carrier Corp.
    - C. McQuay Group
    - D. Snyder-General
    - E. Trane Co.
    - F. The York Int'l.
- 2.2 UNIT DESCRIPTION:
  - 2.2.1 Packaged, factory-assembled, (hermetic)(open) type centrifugal chillers consisting of (two) centrifugal compressor(s), compressor motor(s?), motor starters, evaporator, condenser, controls and panels including gages and indicating lights, auxiliary components, and accessories.
  - 2.2.2 Provide auxiliary condensers of capacity scheduled for heat-recovery units.
- 2.3 COMPONENTS:





2.3.1 Compressor:

- A. Shaft and Impeller Assembly: carbon or forged steel shaft with cast strength aluminum alloy impellers, designed and assembled for no critical speeds within operating range; and statically and dynamically balanced.
- B. Casing: fine grain cast iron with gasket sealed casing joints.
- C. Drive Assembly: connected directly to motor shaft, to operate at motor speed, and designed for balanced thrust.
- D. Drive Assembly: gear transmission integral with compressor and lubricated through compressor lubrication system.
  - 1. Gear Assembly: double helical type gears, with journal bearings babbitt lined and pressure lubricated; provide inspection openings, to facilitate bearing inspection and replacement without disassembly or removal of compressor casing or impeller.
  - 2. Gear Assembly: Helical gear set with aluminum alloy bearings.
- E. Lubrication System: forced circulation type, with positive displacement submerged pump and replaceable oil filter; complete with an automatic oil heater designed to separate refrigerant from oil, and oil cooler if required for proper performance. System shall provide positive pressure lubrication of journals, bearings and seals (if any), during start-up, operation, and coast-down of chiller, including power interruptions. On two compressor units provide redundant oil pump.
- F. Motor and Accessories: hermetically sealed, continuous duty, single speed, squirrel cage, induction type; full load operation of the motor shall not exceed nameplate rating; rotor shaft shall be heat treated carbon steel and designed such that the first critical speed is well above the operating speed. Provide for removal of the stator for service or replacement without breaking the main-refrigerant piping connections.
- G. Motor and Accessories: Open or hermetically sealed; variable speed, controlled by variable frequency AC power from the control system as a part of the capacity reduction controls.
- H. Compressor Motor Starters: Provide separate starters for field mounting and wiring. Starters shall be a star-delta closed transition type, of sizes, ratings, and electrical characteristics scheduled; with a NEMA 1 enclosure. Provide starters with an electronic protection system to monitor and protect against three-phase overload, overload during starting, phase unbalance, and over and under voltage. Field wiring and electrical connections are specified in Division 16.

2.3.2 Evaporator and Condenser:

- A. Shell and Water Boxes: fabricated from welded carbon steel plate. Provide 150 psig maximum working pressure water boxes and nozzle connections. Provide vents, drains, and covers in water boxes to permit tube cleaning within the space shown on the Drawings. Provide suitable tapplings in the water boxes and nozzles for control sensors, gages, and thermometers.
- B. Water Heads fabricated steel water heads with integral water
  - 1. Attachment: Bolt to shell of vessel.



## 15000 - Mechanical

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- 2. Attachment: Weld to tube sheets or vessel assembly. Provide removable covers for access to entire tube sheet without disturbing external water piping. Provide water piping stub-outs, beveled welded connections.
  - C. Tube Sheets: fabricated of thick carbon steel sheets welded to the shell and drilled for tubes. Include intermediate tube support sheets as required to prevent tube vibration.
  - D. Tubes: individually replaceable, finned, seamless copper tubes; removable from either end of the heat exchanger without affection strength and durability of the tube sheets and without causing leakage in adjacent tubes. Expand ends of tubes in tube sheets and intermediate tube support sheets for tight fit to prevent vibration of tubes. Provide suitable baffles or distributing plates in condenser tubes to evenly distribute refrigerant discharge gas on heat transfer tubes.
  - E. Pressure Limiting and Pressure Relief Devices: Manufacturer's standard complying with ASHRAE 15. Provide refrigerant charging and transfer connections, pressure relief device on the evaporator to prevent excessive pressure in refrigerant side, and means to sense refrigerant pressure or temperature..
- 2.3.3 Auxiliary Condenser: Provide condenser separate from or integral with shell of unit condenser and provide completely separate water circuit from normal condenser water flow. Mount separate condensers on chiller:
- 2.4 ACCESSORIES:
- 2.4.1 Purge System: designed to evacuate non-condensable gases and water vapor from the system and for condensing, separating, and returning refrigerant to the system. Provide all necessary devices to automatically isolate purge system from chiller.
- 2.4.2 Pump-out System: Provide on chillers when refrigerants of higher pressure than R-11 are used. Include compressor and drive, piping, wiring, motor starter, and an external refrigerant storage vessel, large enough to hold the entire refrigerant charge. A single pump-out system, with sufficient capacity for the largest chiller, may be used in a multiple chiller application.
- 2.5 CONTROLS AND SAFETIES:
- 2.5.1 Refrigerant Flow Control Devices:
- A. Provide refrigerant flow control devices between evaporator and condensers (and elsewhere as required) to regulate refrigerant flow at volume and pressure required to maintain evaporator liquid refrigerant at level sufficient to keep cooler heat transfer tubes adequately wetted through full range of chiller operation.
  - B. Design devices to permit chiller operation at scheduled conditions, and to allow condenser entering water temperature to decrease to minimum permissible temperature or 1 deg. F (0.5 deg. C) above return chilled water temperature.
- 2.5.2 Capacity Control:
- A. Designed and fabricated to regulate evaporator leaving water temperature. Design for capacity modulation, from full load to scheduled minimum load capacity under normal operating conditions, without overshooting and without hunting at scheduled throttling range.



- B. Provide variable guide vanes to provide stable operation without surge, cavitation, or vibration from 100 to 10 percent of full load capacity, without hot-gas bypass.
  - C. Provide diffuser blocks, designed to operate at part load condition to minimize part load stall, to maintain compressor stability at any load condition.
  - D. Provide a factory-mounted and wired electrical converter to convert constant 440/460/480 volt, 60 hertz, 3 phase power to variable voltage and frequency AC power to the compressor motor; complete with:
    - 1. 60 hertz power input section including 120-volt control transformer;
    - 2. AC to Texas power section;
    - 3. DC to variable voltage and frequency AC inverter section;
    - 4. Capacity control section to control speed of motor and pre-rotation vane position to provide minimum KW input at any load point;
    - 5. Inverter cooling section, air cooled via closed chilled water circuit and centrifugal fan;
    - 6. Instrumentation: ammeter, voltmeter, kilowatt meter, digital frequency meter, and elapsed time meter.
    - 7. Safeties and diagnostics: electronic overloads and indicating light, current fault protection and indication light, power failure indication light, high temperature protection and indication light, transient voltage protection insensitive to input phase sequence, phase loss protection, diagnostic test switches, and hinged access doors with key lock.
- 2.5.3 Demand Limit Devices: Provide adjustable control device to decrease compressor motor power when power demand reaches selected percentage of full load power demand; adjustable from 40 to 100 percent continuously or in increments no greater than 20 percent. Design mechanism to control operation by monitoring motor amperage and modulating inlet vanes.
- 2.5.4 Safety Controls:
- A. Design cutouts to operate independently and factory wire to control panel. Design controls to stop compressor motor in event of low refrigerant pressure or temperature in evaporator; high condenser pressure, high compressor discharge temperature, low evaporator leaving water temperature (freeze-stat), high motor temperature, high bearing temperature, low oil pressure, high oil temperature, compressor motor overcurrent or over voltage, or power interruption. Design each cutout to require manual re-starting of compressor.
  - B. Include anti-recycle timer, factory wired to control panel, limiting compressor motor restarts at scheduled time intervals.
- 2.5.5 Operational Controls:
- A. Provide controls to ensure that compressor will start only under unloaded condition.
  - B. Provide sequencing controls to ensure lubrication of compressor motor bearings and seals (if any). Sequence as follows:
    - 1. Run lubrication system oil so that compressor motor bearing is lubricated before start-up,
    - 2. Start compressor motor,



## 15000 - Mechanical

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3. Provide lubrication during coast-down after compressor motor shut-down.
  - C. Provide modular electronic, solid state, or (if the building control system allows) pneumatic controls.
  - D. Design controls to automatically restart compressor after power failure interruptions, provided minimum time between starts has been compiled with.
- 2.5.6 Diagnostics: Provide a diagnostic module capable of indicating all lockout conditions specified above, plus recording the elapsed time (pre-alarm to alarm), the operating conditions of the compressor motor (amperes), refrigerant temperatures and pressures, and chilled and condenser water temperatures (entering and leaving) at the time of lockout.
- 2.5.7 Control Panel:
- A. Factory-mounted and wired. Provide gages or meters to indicate low refrigerant pressure in evaporator, high condenser pressure, and low oil pressure.
  - B. Provide switches and push-buttons designed to permit indicated operations including the following:
    1. Manual and automatic operation of oil pump.
    2. Manual and automatic operation of oil separator heater.
  - C. Provide pilot lights or visual flag switches for indicated operations and cutouts including the following:
    1. Oil pump operation.
    2. Low chilled water temperature cutout.
    3. Low water flow cutout.
    4. Oil separator heater operation.
    5. Low evaporator refrigerant pressure or temperature cutout.
    6. High condenser pressure cutout.
    7. High motor winding temperature cutout.
    8. Low oil pressure cutout.
    9. Motor overload cutout.
  - D. Provide elapsed time meter designed to automatically record total chiller operating time, in hours.
  - E. Provide electrical interlock to prevent chiller operation when condenser water pump is not operating.
  - F. Provide electrical interlock to prevent chiller operation when chilled water pump is not operating.
- 2.5.8 Vibration Isolation:
- A. Provide devices of type and size recommended by chiller manufacturer, except as otherwise indicated.



- B. Isolation Pad: Commercial vibration isolation material.
- C. Isolation Plates: Sandwich isolation pad between steel mounting plates and glue to each plate.
- D. Spring Assembly: Provide unhouseed free-standing springs between two steel plates at each chiller support point. Provide isolation pad bonded to bottom side of bottom plate. Provide threaded jacking screw on each top plate for attachment to chiller base.

2.6 INSULATION:

2.6.1 Insulate evaporators and other cold surfaces to prevent condensation, with ambient humidity of 75 percent and dry-bulb temperature of 90 deg. F (32 deg. C), no air movement. Use the manufacturer's standard insulation material.

2.6.2 Insulate evaporators and other cold surfaces with semi-rigid glass fiber insulation, to prevent condensation, with ambient humidity of 75 percent and dry-bulb temperature of 90 deg. F (32 deg. C), no air movement.

2.7 FACTORY FINISH: ~

2.7.1 Chiller manufacturers standard factory-finish.

2.7.2 Factory-applied, baked-on, alkyd enamel metal coating on assembled chiller, including exposed ferrous metal surfaces and factory installed insulation.

2.8 SOURCE QUALITY CONTROL:

2.8.1 Test and Inspect: centrifugal chillers in accordance with ASME Boiler and Pressure Vessel Code, Section VIII, Division i.

2.8.2 Performance Verification:

2.8.3 Rate centrifugal chillers in accordance with ARI 550 "Standard for Centrifugal or Rotary Water-Chilling.

2.8.4 Provide a Coefficient Of Performance (COP) for centrifugal chillers not less than prescribed by ASHRAE 90A "Energy Conservation in New Building Design".

3.0 - EXECUTION

3.1 INSTALLATION:

3.1.1 Install chillers in accordance with manufacturers installation instructions.

3.1.2 Install chillers plumb and level, firmly anchored, and maintain manufacturer's recommended clearances for servicing and maintenance.

3.1.3 Install vibration isolators to concrete pad with anchor bolts and secure chiller to vibration isolators.

3.2 PIPING CONNECTIONS:

3.2.1 Piping installation requirements are specified in other sections of Division 15. The Drawings indicate the general arrangement of piping, fittings, and specialties. The following are specific connection requirements:

- A. Install piping adjacent to machine to allow servicing and maintenance.



## 15000 - Mechanical

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- B. Chilled Water Piping: Connect inlet to evaporator with controller bulb well, shutoff valve, thermometer, strainer, flow switch, pressure gage, and union or flange. Connect outlet to evaporator with shutoff valve, balancing cock, thermometer, pressure gage, and union or flange.
- C. Condenser Water Piping: Provide flanged connections to condenser, arranged piping to allow removal of condenser heads. Connect inlet to condenser with shutoff valve, thermometer, plugged tee, and pressure gage. Connect outlet to condenser with shutoff valve, thermometer, drain line and shutoff valve, strainer, and plugged tee.
- D. Auxiliary Condenser: Provide bypass valve to bypass water flow around auxiliary condenser when centrifugal chiller compressor is not operating.
- E. Vent: Provide drain piping as indicated from rupture disc to suitable drain.

### 3.3 FIELD QUALITY CONTROL:

- 3.3.1 Provide the services, to include a written report, of a factory authorized service representative to supervise the field assembly of the components, installation, and piping and electrical connections.

### 3.4 DEMONSTRATION:

- 3.4.1 Provide the services of a factory authorized service representative to provide start-up service and to demonstrate and train the Corpus Christi Army Depot maintenance personnel as specified below.

#### 3.4.1.1 Start-up Service:

- A. Evacuate, dehydrate, vacuum pump and charge with specified refrigerant, and leak test in accordance with manufacturer's instructions. Test and adjust controls and safeties. Replace damaged or malfunctioning controls and equipment.
- B. Perform lubrication service, including filling of reservoirs, and confirming that lubricant is of quantity and type recommended by manufacturer.
- C. Do not place chillers in sustained operation prior to initial balancing of mechanical systems for interface with chillers.

#### 3.4.1.2 Training:

- A. Train the Corpus Christi Army Depot maintenance personnel on start-up and shutdown procedures, troubleshooting procedures, and servicing and preventative maintenance schedules and procedures. Review with the Corpus Christi Army Depot personnel, the data contained in the Operating and Maintenance Manuals specified in PART 1 of this Section and in Division One.
- B. Schedule training with Corpus Christi Army Depot through the Architect/Engineer with at least 7 days prior notice.

END OF SECTION 15674



## SECTION 15681a

### NATURAL DRAFT COOLING TOWERS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of natural draft cooling towers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
  - 2.1 New Cooling Towers shall be constructed in compliance with NFPA.
  - 2.2 Wood Towers:
    - 2.2.1 Framework shall be repaired with or constructed Of redwood complying with CTI STD-IO3, or Douglas fir complying with CTI STD-II4. Douglas fir shall have a preservative treatment in compliance with CTI WMS-II2.
    - 2.2.2 Louvers shall be repaired with or constructed of redwood, Douglas fir or west coast hemlock. Douglas fir and hemlock shall have a preservative treatment in compliance with CTI WMS-II2.
    - 2.2.3 Water Basin shall be repaired with or constructed of redwood or Douglas fir. Douglas fir shall have a preservative treatment in compliance with CTI WMS-II2.
  - 2.3 Metal Towers:
    - 2.3.1 Framework shall be repaired with or constructed of carbon steel complying with ASTM A 36, hot-dipped galvanized in compliance with ASTM. A 123.
    - 2.3.2 Louvers shall be repaired with or constructed of carbon steel complying with ASTM A 366, hot-dipped galvanized in compliance with ASTM A 525.
    - 2.3.3 Water Basin shall be repaired with or constructed of carbon steel complying with ASTM A 366, hot-dipped galvanized in compliance with ASTM A 525.
  - 2.4 Glass Fiber Towers:
    - 2.4.1 Framework shall be repaired with redwood complying with CTI SID-IO3, Douglas fir complying with CTI STD-II4, or carbon steel complying with ASYM A 36, hot-dipped galvanized in compliance with ASTM A 123. Douglas fir shall have a preservative treatment in compliance with CTI WMS-II2.
    - 2.4.2 Louvers shall be of rigid formed plastic.
    - 2.4.3 Water Basin shall be repaired or constructed of redwood or Douglas fir or of carbon steel complying with ASTM A 366, hot-dipped galvanized in compliance with ASTM A 525, Douglas fir shall have a preservative treatment in compliance with CTI WMS-II2.
- 3.0 EXECUTION:
  - 3.1 Existing Cooling Tower to be Repaired shall be repaired in compliance with NFPA 214.



## 15000 - Mechanical

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- 3.2 Welding and Brazing shall be performed in compliance with AWS D1.1.
- 3.3 Damage to Galvanized Coatings shall be repaired by application of galvanizing repair paint.
- 3.4 Testing: Upon completion of repair work on a cooling tower or installation of a cooling tower, the repaired cooling tower shall be tested for proper operation in compliance with the manufacturer's specifications, and with CTI ATP-IO5 and ASME PTC23 for field performance.

END OF SECTION 15681a





## SECTION 15681b

### FORCED DRAFT AND INDUCED DRAFT COOLING TOWERS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of forced draft and induced draft cooling towers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
  - 2.1 New Cooling Towers shall be constructed in compliance with NFPA 214.
  - 2.2 Wood Towers :
    - 2.2.1 Louvers shall be redwood, complying with CTI STD-IO3 or Douglas fir or hemlock complying with CTI STD-II4. Douglas fir and hemlock shall have a preservative treatment in compliance with CTI WMS-II2.
    - 2.2.2 Fill or Contact Surface shall be redwood, complying with CTI STD-IO3, or Douglas fir or hemlock complying with CTI STD-II4. Douglas fir and hemlock shall have a preservative treatment in compliance with CTI WMS-II2.
    - 2.2.3 Drift Eliminators shall be redwood, complying with CTI STD-IO3, Douglas fir or hemlock complying with CTI STD-II4, or rigid formed plastic. Douglas fir and hemlock shall have a preservative treatment in compliance with CTL WMS-II2.
    - 2.2.4 Water Distribution Basin shall be redwood, complying with CTI STD-IO3 or Douglas fir complying with CTI STD-II4. Douglas fir shall have a preservative treatment in compliance with CTI WMS-II2.
    - 2.2.5 Water Collection Basin shall be redwood, complying with CTI STD-IO3, Douglas fir complying with CTI STD-II4, or carbon steel complying with ASTM A 366 and hot-dipped galvanized in compliance with ASTM A 525. Douglas fir shall have a preservative treatment in compliance with CTI WMS-II2.
    - 2.2.6 Framework shall be redwood, complying with CTI STD-IO3, Douglas fir complying with CTI STD-II4, or carbon steel complying with ASTM A 36 and hot-dipped galvanized in compliance with ASTM A 123.
    - 2.2.7 Casing shall be carbon steel, complying with ASTM A 366, hot-dipped galvanized in compliance with ASTM A 525.
  - 2.3 Metal Towers:
    - 2.3.1 Louvers shall be carbon steel, complying with ASTM A 366, hot-dipped galvanized in compliance with ASTM A 525.
    - 2.3.2 Fill or Wet Deck shall be carbon steel in compliance with ASTM A 366 and hot-dipped galvanized in compliance with ASTM A 525, rigid formed plastic, or stainless steel complying with ASTM A 167.
    - 2.3.3 Drift Eliminators shall be carbon steel, complying with ASTM A 366 and galvanized in compliance with ASTM A 525 rigid plastic, or stainless steel complying with ASTM A 167.



## 15000 - Mechanical

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- 2.3.4 Water Distribution Basin shall be carbon steel, complying with ASTM A 366, hot-dipped galvanized in compliance with ASTM A 525.
- 2.3.5 Water Collection Basin or Pan shall be carbon steel, complying with ASTM A 366 and hot-dipped galvanized in compliance with ASTM A 525 or stainless steel complying with ASTM A 167.
- 2.3.6 Framework shall be carbon steel, complying with ASTM A 36, hot-dipped galvanized in compliance with ASTM A 123; or stainless steel complying with ASTM A 167.
- 2.3.7 Casing shall be carbon steel, complying with ASTM A 366, hot-dipped galvanized in compliance with ASTM A 525; or stainless steel complying with ASTM A 167.
- 2.4 Glass Fiber Towers:
  - 2.4.1 Louvers shall be formed rigid plastic.
  - 2.4.2 Fill shall be rigid plastic complying with Fed. Spec. L-P-535.
  - 2.4.3 Drift Eliminators shall be formed rigid plastic.
  - 2.4.4 Water Distribution Basin shall be redwood, complying with CTI STD-IO3, Douglas fir complying with CTI STD-II4, carbon steel complying with ASTM A 36 and hot-dipped galvanized in compliance with ASTM A 123, or carbon steel complying with ASTM A 366 and hot-dipped galvanized in compliance with ASTM A 525. Douglas fir shall have a preservative treatment complying with CTI WMS-II2.
  - 2.4.5 Water Collection Basin shall be redwood, complying with CTI STD-IO3, Douglas fir complying with CTI STD-II4, carbon steel complying With ASTM A 36 and hot-dipped galvanized in compliance with ASTM A 123, or carbon steel complying with ASTM A 366 and hot-dipped galvanized in compliance with ASIM A 525. Douglas fir shall have a preservative treatment complying with CTI WMS-II2.
  - 2.4.6 Framework shall be redwood, complying with CTI STD-IO3, Douglas fir complying with CTI STD-II4, or carbon steel complying with ASTM A 36 and hot-dipped galvanized in compliance with ASTM A 123. Douglas fir shall have a preservative treatment complying with CTI WMS-II2.
  - 2.4.7 Casing shall be carbon steel, complying with ASTM A 366, hot-dipped galvanized in compliance with ASTM A 525.
- 3.0 EXECUTION:
  - 3.1 Existing Cooling Tower to be Repaired shall be repaired in compliance with NFPA 214.
  - 3.2 Welding shall be performed in compliance with AWS DI.I.
  - 3.3 Damage to Galvanized Coatings shall be repaired by application of galvanizing repair paint.
  - 3.4 Testing: Upon completion of repair work on a cooling tower or installation of a cooling tower, the repaired cooling tower shall be tested for proper operation in compliance with the manufacturer's specifications, CTI ATP-IO5, and ASME PTC23, for field performance.

END OF SECTION 15681b



## SECTION 15699

### REFRIGERATION SPECIALTIES

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of refrigeration specialties including dual pressure switch, differential oil pressure switch, expansion valve, solenoid refrigerant valve, safety thermostats, temperature controller, pressure relief valves, charging valves, sight glass, oil strainer, liquid line drier and strainer, discharge, suction and oil pressure gauges with shut-off valves. Operational indication lights for power on, oil failure, hi-lo pressure cut-out, and low temperature cut-out. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support work.
- 2.0 PRODUCTS:
- 2.1 Thermostatic Expansion Valves shall be rated and tested in accordance with ASHRAE Standard 17 or ARI Standard 750.
- 2.2 Filter Dryers shall be sealed in-line type or replaceable core type as required. Filter dryers shall be tested and rated in accordance with SHRAE Standard 63 and ARI Standard 710 and shall meet the requirements of UL Standard 207.
- 2.3 Sight Glasses for moisture and liquid indication shall be UL listed.
- 2.4 Refrigerants shall be designated in accordance with ANSI/ASHRAE 34. For new and altered work if required.
- 2.5 Testing of Refrigerant Lines: In the presence of a representative of the Contracting Officer, the refrigerant piping shall be tested before charging. Minimum test pressure shall be 300 psig for the high side and 150 psig for the low side. Pressure may be applied with Refrigerant-22, with a mixture of Refrigerant-22 and nitrogen, for with nitrogen alone. Joint shall be rechecked for leaks with full operating pressure after charging.
- 3.0 EXECUTION: Installation of all refrigeration equipment shall comply with ASHRAE Standard 15.

END OF SECTION 15699



## SECTION 15715a

### STEAM AND HOT WATER UNIT HEATERS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of steam and hot water unit heaters. Products shall match existing materials and/or shall be as directed-by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
  - 2.1 New Unit Heaters shall comply with the requirements of AMCA 99 and 210; NFPA 70; and UL Electrical Construction Materials List.
  - 2.2 Coils:
    - 2.2.1 Coils shall be constructed of round seamless copper tubing complying with ASTM B 75, mechanically or hydraulically bonded or expanded into fins constructed of copper or of aluminum complying with ASTM B 209. Tube joints shall be made with high temperature brazing alloys complying with ASTM E 56. Units having two row coils shall have the tube rows staggered to provide maximum heat output.
    - 2.2.2 Coil Headers shall be fabricated from seamless carbon steel pipe complying with ASTM A 53, extra heavy seamless copper tubing complying with ASTM B 75 or B 251, or semi-steel complying with ASTM A 126, Class C.
  - 2.3 Housings shall be fabricated from sheet steel complying with ASTM A 569 of a thickness and of sufficient strength to ensure rigidity. Unit heater housings shall be provided with means of suspension or floor mounting as required.
  - 2.4 Fan and Drive:
    - 2.4.1 Propeller and Centrifugal Fans shall be fabricated of aluminum or steel.
    - 2.4.2 Centrifugal Fan Shaft shall be sized for maximum fan speed.
    - 2.4.3 Fan Bearings on belt-driven units shall be self-aligning, permanently lubricated, or the periodic lubricating type with accessible lubricating means. Bearings shall be designed to withstand radial and thrust working loads.
  - 2.5 Controls: Unit heaters shall be furnished with unit-mounted line voltage thermostats to provide ON/OFF fan control.
- 3.0 EXECUTION:
  - 3.1 Welding shall be in compliance with AWS D1.1.
  - 3.2 Brazing shall be in compliance with ASME Code Section IX.
  - 3.3 Damage to Galvanized Coatings shall be repaired by applying galvanizing repair paint.
  - 3.4 Steam Heating Elements shall be tested with air at a minimum pressure of 300 PSI under water.



END OF SECTION 15715a



## 15000 - Mechanical

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### SECTION 15715b

#### CLEANING OF HEAT EXCHANGERS

- 1.0 DESCRIPTION OF WORK: This specification covers the cleaning of heat exchangers. Products and materials used shall be in accordance with the heat exchanger manufacturer's recommendations and/or shall be as directed by the Contracting Officer. Cleaning procedures shall be developed by the Contractor and shall be in accordance with the heat exchanger manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Equipment required for cleaning such as acid feed tank and pump, alkaline feed tank and pump, mixer, neutralizing tank and pump, power brushes, power cutters, and other related items shall be supplied by the Contractor.
- 2.2 Chemical Cleaning Materials:
- 2.2.1 Acid Cleaning Chemicals shall be hydrochloric acid, ammonium bichloride  $\text{NH}_4\text{HF}_2$ , and sulfuric acid
- 2.2.2 Neutralizing Chemicals shall be one percent soda ash solution complying with ASTM D 458 and one percent caustic solution complying with ASTM D 456.
- 2.2.3 Flushing Water shall be potable having not more than 1,000 ppm total solids.
- 2.3 Mechanical Cleaning Materials and Equipment:
- 2.3.1 Hot Water shall be used for high velocity wash.
- 2.3.2 Powered Brushes shall be of the type for use with power units.
- 2.3.3 Nylon Brushes shall be of the type blown with high pressure water.
- 3.0 EXECUTION:
- 3.1 General: Clean heat exchangers of all scale and deposits. Straighten and clean fins on finned tubes.
- 3.2 Inspection: After heat exchanger cleaning operation, tubes will all be given a visual inspection by the Contracting Officer for effectiveness of scale removal.
- 3.3 Welding and Burning: No welding or burning shall be allowed during cleaning operation.
- 3.4 Acid Wash Time may vary from four to eight hours depending on scale analysis. Time shall represent actual retention of the solvent in the unit, including filling and draining time.
- 3.5 Effluent Neutralization: Solvent effluent drained from the unit shall be neutralized with caustic in compliance with ASTM D 456 or soda ash in compliance with ASTM D 458, to a pH of 8.0 to 8.5.

END OF SECTION 15715b



## SECTION 15715c

### CLEANING AND TREATMENT OF HOT AND/OR CHILLED WATER SYSTEM

- 1.0 DESCRIPTION OF WORK: This specification covers the cleaning of heat exchangers. Products and materials used shall be in accordance with the heat exchanger manufacturer's recommendations and/or shall be as directed by the Contracting Officer. Cleaning procedures shall be developed by the Contractor and shall be in accordance with the heat exchanger manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
  - 2.1 Equipment required for cleaning such as acid feed tank and pump, alkaline feed tank and pump, mixer, neutralizing tank and pump, power brushes, power cutters, and other related items shall be supplied by the Contractor.
  - 2.2 After the hot and/or chilled water systems installation has been completed and tested, they shall be chemically cleaned. Notify the Contracting Officer 48-hours in advance of starting the cleaning operation. In the presence of a representative of the Contracting Officer, one of the following solutions shall be placed in the system and circulated: (1) Tri-Sodium Phosphate - one pound for each fifty gallons of water in the system; (2) Sodium Carbonate - one pound for each thirty gallons of water in the system; or (3) Sodium Hydroxide (Lye) - one pound for each fifty gallons in the system. Their preference is in the order named, and a solution of only one type shall be used.
- 3.0 EXECUTION:
  - 3.1 Fill, vent, and circulate this solution through the system, allowing it to reach design or operating temperature. After circulating for not less than 8-hours, the solution shall be drained completely from the system, strainers shall be cleaned, and the system shall be refilled with fresh water. The water shall be circulated for one hour, and, at that time, a sample of the water shall be tested for alkalinity in the presence of a representative of the Contracting Officer. A pH reading between 7 and 8 shall be obtained in order to receive approval.
  - 3.2 Treatment of Hot and/or Chilled Water Systems: The Contractor shall employ the services of a qualified water treatment specialist, acceptable to the Contracting Officer, who shall maintain the water in each hot and/or chilled water system at optimum condition to inhibit corrosion, pitting, rust and scale formation. Contractor shall submit for approval by the Contracting Officer, an outline of the water treatment the specialist proposes to use. The services of the water treatment specialist shall begin when the testing and cleaning of the water systems have been satisfactorily completed, and shall continue until the end of the warranty period. During this time, a certified laboratory report of the water condition of each chilled water system shall be forwarded to the Contracting Officer each month.

END OF SECTION 15715c



## SECTION 15732

### CONVERTERS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of converters. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

1.1 Submittal:

- A. Product Data: Submit manufacturer's technical product data for converters including performance charts, test data, materials, dimensions, weights, and installation instructions.
- B. Shop Drawings: Submit manufacturer's assembly-type shop drawings indicating dimensions, weight loading, required clearances, and method of assembly of components.
- C. Maintenance Data: Submit maintenance data and parts list. Include this data in maintenance manual.

1.2 Quality Assurance:

- A. Manufacturer's Qualifications: Firm regularly engaged in manufacture of converters, of types, materials, and sizes required, whose products have been in satisfactory use in similar service for less than 5 years.
- B. Code and Standards: Fabricate converters in accordance with ASME Code for Unfired Pressure Vessels.

2.0 PRODUCTS:

2.1 Converters - General:

- A. Provide steam in shell, water in tube type. Arrange tubes to provide the number of passes indicated. Furnish converters complete with cast iron or steel saddles, for securing to supports.
- B. Furnish "U" tube type converters with a removable water chamber for ease of inspection and removal of tube bundle.

DELETE B ABOVE WHEN STRAIGHT THRU TYPE.

DELETE B BELOW WHEN "U" TUBE TYPE.

- B. Furnish straight through type converters through type converters with a floating head and water channel for inspection and cleaning of tubes, without breaking the water connections.

2.2 Materials:

- A. Shell: Carbon steel.
- B. Bonnet and Cover: Cast iron.





- C. Tube Sheets: Steel or bronze.
  - D. Tubes: 3/4" O.D., 20 BW gauge minimum, seamless drawn copper.
  - E. Saddles: Cast iron or Steel.
- 2.3 Manufacturers: Subject to compliance with requirements, manufacturers offering converters which may be incorporated in the work include, but are not limited to the following:
- Bell and Gossett ITT; Fluid Handling Div., Dunham-Bush Inc.
- 3.0 EXECUTION:
- 3.1 Inspection: Examine areas and conditions under which converters are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to the Contracting Officer.
- 3.2 Installation:
- A. Install converters so as to allow for removal of heating elements, without disturbing installed equipment or piping. Secure converter saddles to structural steel supports or concrete piers. Cross brace steel supports all four ways; weld supports to base plates and anchor bolt to floor.
  - B. Steam Piping: Provide piping as indicated, including control valve, strainer, and pressure gage on inlet; condensate dirt leg, steam trap, strainer and check valve on outlet; air vent or vacuum breaker on shell.
  - C. Water Piping: Provide piping as indicated including union, shutoff valve, and thermometer on outlet. Pipe relief valve outlet to drain.
- 3.3 Adjusting and Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.
- 3.4 Spare Parts: Deliver one spare tube bundle for each size and type of converter to the Contracting Officer's Representative. Suitably box and label. Furnish spare gasket for each flange connection for each converter.

END OF SECTION 15732



## SECTION 15741

### INDUCTION UNITS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of induction units. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturers recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 New Induction Units shall include cabinet, primary air plenum with inlet collar, air balancing damper, multi-stage nozzles, coil, drain pan, and discharge stack. Units shall be tested and rated at the factory in accordance with ARI standard 445.
- 2.2 Cabinet and Primary Air Plenum shall be constructed of or repaired with 24 gauge galvanized steel with die-cast support frame members. Plenum shall be lined with 3/8-inch thick, 25-pound density insulation, black plastic bonded fiberglass, mat-faced.
- 2.3 Nozzles shall be provided in vertical strips, precision-molded from heat-resistant thermoplastic material. Nozzles shall be designed for temperature range encountered with pressures up to 3-1/2 inch wg. Nozzle strips shall be mechanically sealed and locked to nozzle frame.
- 2.4 Dampers shall be multiple-hole design and shall extend the full length of the plenum. Adjustment shall be provided by manual push-pull operator located next to the primary air inlet.
- 2.5 Coils shall be designed for 300 psi working pressure.
- 3.0 EXECUTION:
- 3.1 Induction Units shall be installed level, using shims if required, and anchored to the floor.
- 3.2 Damage to Galvanized Coatings: shall be repaired with galvanized paint.

END OF SECTION 15741



## SECTION 15745

### RADIATORS AND CONVECTORS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of radiators. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
- 2.1 New Radiators shall comply with AGA Directory of Certified Appliances and Accessories; IBR Testing and Rating Code for Finned Tube (Commercial) Radiation, if applicable; NFPA 70; and UL 499 or UL 795, as applicable.
- 2.2 Cast Iron Radiators:
- 2.2.1 Core shall be small tube section constructed of cast iron complying with ASTM A 48.
- 2.2.2 Core Sections shall be assembled with malleable iron or polytetrafluoroethylene coated steel push nipples.
- 2.3 Fin-Tube Convectors and Enclosures:
- 2.3.0.1 General
- Furnish and install fin-tube convectors, complete with steel enclosures, pipe support brackets, vertical support brackets, etc., as shown on the drawings and as specified. Fin-tube convectors shall have steel or non-ferrous heating elements as indicated on the drawings. Refer to Standard Details.
- 2.3.1 Heating Elements:
- 2.3.1.1 Steel
- Elements for fin-tube steel convectors shall be constructed of steel tubes and steel fins with the tubes drawn through the fins and expanded, thus forming tight metal to metal contact. Fins shall be properly spaced prior to expanding the tubes. Except otherwise shown on the drawings, there shall be 40 fins per linear foot with fins 4 1/4 x 4 1/4 - inch in size and .032-inch thick. The tubes shall be 1 1/4 inch in size seamless or electric resistance welded pressure tubing (ASTM A-214) with wall thickness not less than 0.125-inch. Elements shall be single width and 1, 2, or 3 rows high as shown on the drawings. Each row shall be welded together with welding return bends (6-inches center to center), thus forming a continuous welded unit with only the inlet and outlet connections threaded. Each unit shall be tested at not less than eighty (80) pounds per square inch hydrostatic pressure and made tight at that pressure.
- 2.3.1.2 Non-Ferrous
- Elements for non-ferrous convectors shall be constructed of aluminum fins and copper tubes and they shall be fabricated and tested in a manner similar to the steel elements specified above, except that



## 15000 - Mechanical

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return bends shall be solder type copper (6-inches center to center). There shall be 40 fins per linear foot with fins 4 1/4 x 4 1/4-inch size, .020-inch thick aluminum. Fins shall be permanently bonded to the tube by having a mandrel drawn through the tube, thereby uniformly expanding the tube against the fins. Alloy and minimum temper for aluminum fins shall be 3003-H18. Tubes shall be 1 1/4-inch nominal size, 1 3/8-inch O.D. type K copper.

### 2.3.2 Ratings, Etc., for Fin-Tube Radiation

Sizes of tubes and fins, thickness of fins, spacing of fins and lengths of finned tubes shall be as shown on the drawings. Fin-Tube convector ratings shall be approved under the latest edition of the IBR Ratings for Finned Tube (Commercial) Radiation. In addition to the above approval, the ratings shall be not less than those tabulated on the drawings for the types of construction and various rows, heights, etc.

### 2.3.3 Supports for Fin-Tube Convectors

Fin-tube convector elements shall be supported in accordance with drawings. Approved alternate design of support brackets may be substituted provided they are adjustable both horizontally and vertically.

### 2.3.4 Enclosures for Fin-Tube Convectors

#### 2.3.4.1

Fin-tube convector enclosures in rooms of instruction shall fill the entire space between the piers adjoining the windows, unless otherwise indicated. Where an enclosure does not terminate at a pier or a wall, the enclosure shall be extended to cover the end of the convector, including the piping connections, and an end enclosure or cap of the same gauge as the front shall be installed. Enclosures shall be constructed of cold rolled sheet steel, and shall be of gauges, etc., as shown on the drawings. Steel members of the enclosure which contact aluminum window parts shall be coated with zinc chromate primer before installation. Grilles may be of stamped steel. Panel fasteners shall be Dzus or Camloc type, with slotted heads.

The 1/2 inch thick insulation behind the convector elements shall be 3-pound density rigid fiberglass board. The shield protecting the insulation shall be No. 20-gauge galvanized sheet steel.

#### 2.3.4.2

Where expanded metal enclosures are indicated on the drawings, the enclosures shall be fabricated of 1/2 - inch diamond mesh, No. 16-gauge expanded steel, flattened. A 1/2 inch wide steel band shall be spot welded to each end of the enclosure. Enclosure shall cover the convector at top, bottom and front and shall be fastened to the wall with expansion bolts and shields.

### 2.3.5 Approval

In order to receive approval for Fin-Tube convectors and enclosures, Contractor shall submit complete shop drawings showing details of construction, and the ratings for the convector elements. He shall submit a sample of the convector element if it has not already been approved.

## 2.4 Radiant Radiators:

#### 2.4.1

Gas Plenum shall be carbon steel with a porcelain enameled finish complying with ASTM A 424, or galvanized in compliance with ASTM A 526.

#### 2.4.2

Air Mixer shall be carbon steel with a corrosion-resistant finish complying with ASTM A 526 or ASTM A 568.



- 2.4.3 Venturi shall be carbon steel complying with ASTM A 526 or ASTM A 568 with a corrosion-resistant finish.
- 2.4.4 Enclosure shall be carbon steel complying with ASTM A 526 or ASTM A 568.
- 2.5 Convactor Radiators:
- 2.5.1 Electric Heating Element shall be constructed of nickel chromium wire enclosed within a metal sheath and electrically insulated in the sheath with a densely compacted refractory material.
- 2.5.2 Hydronic/Steam Heating Elements shall be constructed of seamless copper tubing complying with ASTM B 75 mechanically expanded into aluminum fins. The tube and fin assembly shall be encased in a frame of steel complying with ASTM A 568. Tube headers shall be steel or brass joined to the tubes by high temperature brazing alloys complying with ASTM E 56.
- 2.5.3 Enclosure, Dampers, Element Supports, and Access Doors (when applicable) shall be fabricated from carbon steel complying with ASTM D 568.
- 3.0 EXECUTION:
- 3.1 Welding shall be performed in accordance with AWS D1.1.
- 3.2 Damage to galvanized coatings shall be repaired by application of galvanizing repair paint.
- 3.3 Convactor Protection:
- Convectors shall be shipped from the factory in suitable protective covering. They shall be installed in time for temporary heat use, and provision shall be made to prevent their being clogged with plaster, etc., Effective protection (e.g., plywood perforated for air circulation or expanded metal) shall be installed at the top and front of each convactor element from the time of installation until the permanent enclosures are in place so as to prevent damage to fins, tubing, etc., during the period of building construction. Convactor element openings shall be closed with suitable plugs or caps at the plant to prevent the entrance of dirt, sand, etc., and to protect the threads.
- 3.4 Shop Drawings and Schedules:
- Detailed shop drawings and schedules of all types of convectors and enclosure shall be submitted to the Contracting Officer for his approval before this equipment is shipped from the factory.
- Painting:
- A. The inside and outside surfaces of each enclosure shall be primed at the factory with a sprayed coat of zinc chromate paint. Enclosures fabricated from zinc alloy coated steel sheets shall be prime painted only if the mill coating has been damaged.
- B. Finish painting of enclosures will be done by the Contractor after installation of the enclosures. Interior surfaces of enclosures visible from the outside shall be painted by the HVAC Contractor with one coat of flat black paint.

END OF SECTION 15745



## SECTION 15750

### COILS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of coils. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials' shall be as required to support the work.
- 2.0 PRODUCTS:
  - 2.1 Pressures:
    - 2.1.1 Water Coil Design Working Pressure shall be 200 psig.
    - 2.1.2 Steam Coil shall be designed for operation on low pressure steam.
    - 2.1.3 Each Replacement Water or Steam Coil shall be hydrostatically tested at 250 psig at the factory.
    - 2.1.4 Each Replacement Direct Expansion Coil shall be pneumatically tested at the factory under water at not less than 300 psig. Each coil shall be completely dehydrated and sealed at the factory upon completion of pressure tests.
  - 2.2 Water, Steam, and Direct Expansion Coils:
    - 2.2.1 Tubing shall be round, seamless, copper tubing, complying with ASTM B 75.
    - 2.2.2 Fins shall be aluminum or copper.
    - 2.2.3 Coil Casing shall be made of galvanized sheet steel complying with ASTM A 526, minimum thickness of 16 gauge and shall be ganged and provided with holes for attachment to ductwork. Coil shall be pitched within casing toward the return end.
    - 2.2.4 Water or Steam Coil Headers shall be fabricated from steel pipe complying with ASTM A 53, Grade B; extra heavy seamless copper tubing complying with ASTM B 75; or semisteel complying with ASTM A 126, Class C. Coils shall be made with not less than 5/8-inch O.D. copper tubes of .028-inch minimum wall thickness, plate type or spiral wound aluminum fins. Fins shall have integral stamped collars and shall be mechanically bonded to the tubes.
    - 2.2.5 Direct Expansion Coil Headers shall be fabricated from extra heavy seamless copper tubing complying with ASTM B 75.
    - 2.2.6 Each Water Coil shall be provided with a plugged vent tap and drain tap.
    - 2.2.7 Steam distributing (non-freeze) coils shall be made with 1-inch (minimum) O.D. condensing tubes, 5/8-inch (minimum) O.D. inner steam distributing tubes, plate type or spiral wound aluminum fins, and headers of copper, cast iron or fabricated wall thickness of not less than .035-inches and the distributing tubes shall be copper with .028-inches minimum wall thickness. Each distribution tube shall be provided with a means of centering it within the condensing tube. The performance of each steam distributing coil shall be such that under all quantities of steam supply, from maximum capacity



to ten percent of maximum capacity, the steam will be delivered over the entire length of the heating surface with a maximum variation in temperature rise not exceeding a six degree deviation from the average rise through the heating surface.

### 2.3 Electrical Heating Coils (and Heat Strips):

2.3.1 Resistance Wire shall be nickel-chromium wire.

2.3.2 Tubular Sheath shall be corrosion-resisting in the surrounding medium and suitable for the temperatures required by the particular application.

2.3.3 Insulating Material shall be densely packed, high purity magnesium oxide.

2.3.4 Insulator Supports for directly exposed elements shall be ceramic or porcelain.

2.3.5 Grid and Heat Strip Elements shall have the resistance wire surrounded by the insulation material and enclosed within the tubular sheath. The sheath shall be imbedded and completely sealed within the cast aluminum grid. Electrical terminals shall project through the cast aluminum grid and shall be designed to minimize the entrance of atmospheric moisture into the heating element.

2.3.6 Heat Strip Element resistance wire shall be uniformly spaced along the length of the sheath.

### 3.0 EXECUTION:

3.1 Fins shall be mechanically bonded or soldered to the tubes. Tubes shall be rolled and bushed, brazed, or welded to headers. Where required, multiple type supports shall be provided to prevent tube sag. The fin tube and header section shall float within the casing to allow free expansion.

### 3.2 Removing, Saving, Testing, Cleaning, and Recharging Refrigerants:

3.2.1 Refrigerant in a system in which the coil is to be repaired or replaced shall be removed, saved, and reused in recharging the system. When repair or replacement of the coil has been completed, the refrigerant system shall be pressure-tested and recharged with refrigerant.

3.2.2 The repaired coil shall be pressure-tested to 300 psig with dry nitrogen and allowed to stand for 24 hours with no pressure drop after repair or replacement of the coil. Then evacuate the system and/or coil with a vacuum pump capable of pulling 1 mm Hg vacuum absolute. Operate the vacuum pump until a vacuum of 2.5 mm Hg absolute is reached. After evacuation, recharge the system with the refrigerant previously removed.

Recharge the refrigerant back into the system through a filter drier with capacity capable of removing foreign materials and moisture in the amount of refrigerant removed. The system shall be replenished with refrigerant to provide a fully charged system.

3.2.3 If the system has lost its full charge of refrigerant, a new suction line and liquid line filter drier, sized as recommended by the condenser manufacturer, shall be provided and the system pressure tested, evacuated, and recharged with refrigerant as specified above.

3.3 Welding shall be in compliance with AWS D1.1.

3.4 Brazing shall be in compliance with ASME Code Section IX.

3.5 Damage to Galvanized Coatings shall be repaired by application of galvanizing repair paint .



## 15000 - Mechanical

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- 3.6 Testing: Hydrostatically test repaired water and steam coils at 1-1/2 times the maximum working pressure.
- 3.7 Supports: Heating coils supported from the floor shall be provided with a sufficient number of No. 14-gauge galvanized sheet steel formed legs, reinforced and bolted. Ceiling mounted heating coils shall be supported from overhead floor beams or from auxiliary steel beams provided by the Contractor for this purpose. Coils shall be supported independently of connecting ductwork.
- 3.8 Approved Makes: Heating coils manufactured by Aerofin Corp., Airtherm Mfg. Co., American Air Filter Corp., Bohn Heat Transfer Division, Carrier Corp., Dunham-Bush Inc., Mcquay Inc., Trane Co. or York Division of Borg Warner conforming to the requirements of the specifications and the drawings will be accepted. Submit shop drawings for approval.

END OF SECTION 15750





## SECTION 15760

### ELECTRIC UNIT HEATERS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of electric unit heaters. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Provide and install an electric unit heater in each location shown on the drawings. Each unit heater shall consist of an electric heating element, fan, motor, controls, etc., factory assembled in a sheet steel casing. Casing shall receive a bonderized rust-preventive coating, and a finished coat of baked enamel. Controls shall consist of an automatic temperature controlling thermostat located at the air intake to the heating element, and a fan delay switch which will prevent the fan from starting until the heating element is warm. Thermostat shall be capable of field adjustment, and shall be set initially at 40 F. Each unit heater shall be suspended by a bracket secured to an overhead floor beam or to an auxiliary steel beam installed by the HVAC Contractor for this purpose. Electric unit heaters shall carry the UL label and shall be American Air Filter Co.'s, Emerson Electric Co.'s, Chromalox, Singer Co.'s Electromode or other approved equal, operating on single phase, 208-volt service. Submit shop drawings for approval. Contractor will provide service wiring to each unit heater.

END OF SECTION 15760



## SECTION 15770a

### PACKAGED HEATING AND COOLING UNITS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of air-cooled packaged heating and cooling units, including through-wall, roof top, and computer room type units with electrical heat. Products shall be as directed by the Contracting Officer, Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
- 2.1 Capacity and Performance shall be based on standard air density (0.075 pounds per cubic foot). Fans shall have a peak static efficiency of not less than 60 percent. Capacity ratings shall be in accordance with ABI standard 360 for equipment rated at 135,000 Btu or over and ARI 210 for smaller units.
- 2.2 Casing shall have a corrosion protective coating. Casing shall have 1/2-inch thick minimum thermal insulation and the compressor compartment shall have acoustical insulation.
- 2.3 Compressors shall be direct drive semi-hermetic with a maximum operating speed of 1,750 rpm. Each compressor shall have an independent refrigeration circuit with integral sub-cooling unit.
- 2.4 Evaporator Coils shall be copper tubing with aluminum fins. New coils shall be pressure and leak tested at the factory at 1.5 times the working pressure. .
- 2.5 Filters shall be 2-inch thick throwaway type.
- 2.6 Condensers shall have copper tubes and aluminum fins. New condensers shall be "leak tested at the factory at 1.5 times the working pressure. A separate direct drive fan shall be included for each refrigeration circuit.
- 2.7 Heating Coil shall be low watt density, fin-tubular construction, protected by thermal safety switches.
- 2.8 Humidifier of the infrared type shall be provided for computer room type units.
- 3.0 EXECUTION:
- 3.1 Welding shall be performed in accordance with AWS D1.1 and/or ASME Code Section IX.
- 3.2 Brazing shall be performed in accordance with ASAE Code Section IX.
- 3.2 Damage to Galvanized Coatings shall be repaired with galvanized paint.
- END OF SECTION 15770a



## SECTION 15770b

### ROOFTOP HEATING AND COOLING UNITS

#### 1.0 - GENERAL

- A. Section includes package rooftop heating and cooling units. The intent of this contract is to replace the existing multizone "Nesbitt" Roof Top Units with new Single Zone Units, while reusing the existing roof curb.

Start here

- B. Related Sections:

1. Section 15645c - Natural Gas Systems
2. Section 15840 - Ductwork
3. Section 15043 - Testing, Adjusting, and Balancing

#### 1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data, including rated capacities of selected model clearly indicated, dimensions, required clearances, weights, furnished specialties and accessories; and installation and start-up instructions.
- B. Shop Drawings:
  1. Submit shop drawings retailing the manufacturer's electrical requirements for power supply wiring for rooftop heating and cooling units.  
  
Submit manufacturer's ladder-type wiring diagrams for interlock and control wiring. Clearly differentiate between portions of wiring that are factory-installed and portions to be field-installed.
  2. Submit shop drawings detailing the mounting, securing, and flashing of the roof curb to the roof structure. Indicate coordinating requirements with roof membrane system.
- C. Operation and Maintenance Data: Submit maintenance data and parts list for each rooftop unit, including "trouble-shooting" maintenance guide, servicing guide and preventative maintenance schedule and procedures. Include this data in maintenance manual; in accordance with requirements of Division 1.

#### 1.4 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of rooftop heating and cooling units, of types and capacities required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Codes and Standards:



## 15000 - Mechanical

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1. Gas-fired furnace section construction shall be in accordance with AGA safety standards. Furnace section shall bear the AGA label.
2. Testing and rating of rooftop units of 135,000 btu/hr capacity or over shall be in accordance with ARI 360 "Standard for Commercial and Industrial Unitary Air-conditioning Equipment".
3. Refrigerating system construction of rooftop units shall be in accordance with ASHRAE 15 "Safety Code for Mechanical Refrigeration".
4. Energy Efficiency Ratio (HER) of rooftop units shall be equal to or greater than prescribed by ASHRAE 90A "Energy Conservation in New Building Design".
5. Rooftop units shall be designed, manufactured, and tested in accordance with UL requirements.

### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Handle rooftop units and components carefully to prevent damage. Replace damaged rooftop units or components with new.
- B. Store rooftop units and components in clean dry place, off the ground and protect from weather, water, and physical damage.
- C. Rig rooftop units to comply with manufacturer's rigging and installation instructions for unloading rooftop units, and moving them to final location.

### 1.6 SCHEDULING AND SEQUENCING

- A. Coordinate installation of unit on existing roof curb with roof structure.
- B. Coordinate roof openings for mechanical and electrical connections.

### 1.7 SPECIAL WARRANTY

- A. Warranty on Compressor and Heat Exchanger: Provide written warranty, signed by manufacturer, agreeing to replace/repair, within warranty period, compressors and heat exchangers with inadequate and defective materials and workmanship, including leakage, breakage, improper assembly, or failure to perform as required; provided manufacturer's instructions for handling, installing, protecting, and maintaining units have been adhered to during warranty period. Replacement is limited to component replacement only, and does not include labor for removal and reinstallation.
  1. Warranty Period: 5 years from date of substantial completion.

### 1.8 MAINTENANCE

- A. Extra Materials: Furnish to Corpus Christi Army Depot, with receipt, the following spare parts for each rooftop heating and cooling unit:
  1. One set of matched fan belts for each belt-driven fan.
  2. One set filters for each unit.

## 2.0 - PRODUCTS

### 2.1 ROOFTOP UNITS 20 TONS AND LARGER



- A. Available Manufactures: Subject to compliance with requirements, manufacturers offering rooftop units which may be incorporated in the work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide rooftop units of one of the following:
  - 1. Nesbitt Inc.
  - 2. Carrier Air Conditioning; Div. of Carrier Corp.
  - 3. Mammoth.
  - 4. Seasonair.
  - 5. Lennox Industries, inc.
  - 6. McQuay Air Conditioning Group; McQuay Inc.
  - 7. Aeon inc.
  - 8. York; Div. of York International.
- C. General Description: Rooftop unit shall be factory-assembled and tested, designed for roof installation and, consisting of compressors, condensers, evaporator coils, condenser and evaporator fans, refrigeration and temperature controls, filters, and dampers. Capacities and electrical characteristics are scheduled on the Drawings.
- D. Casing manufacturer's standard casing construction, having corrosion protection coating, and exterior finish. Casings shall have removable panels or access doors for inspection and access to internal parts, a minimum of 1 " thick thermal insulation, knockouts for electrical and piping connections, and an exterior condensation drain connection, and lifting lugs.
- E. Roof Curbs: Contractor shall use existing roof curb to install the Roof Top Unit.
- F. Evaporator Fans: Forward-curved, centrifugal, belt-driven fans with adjustable sheaves; and permanently lubricated motor bearings.
- G. Condenser Fans: Propeller-type, direct-driven fans with permanently lubricated bearings.
- H. Coils:
  - 1. General: Aluminum plate fin and seamless copper tube type. Fins shall have collars drawn, belled and firmly bonded to the tubes by means of mechanical expansion of the tubes. No soldering or tinning shall be used in the bonding process. Coils shall have a galvanized steel casing. Coils shall be mounted in the coil casing with same end connections accessible for service. Coils shall be removable from the unit through the roof or through the piping enclosure. Coil section shall be completely insulated.
  - 2. Refrigerant Cooling Coils: Have an equalizing type vertical distributor to ensure each coil circuit receives the same amount of refrigerant. Coils shall be proof (450 psig) and leak (300 psig) tested with air pressure under water, then cleaned, dehydrated, and sealed with a holding charge of nitrogen.
- I. Compressors: Serviceable, semi-hermetic, or hermetic compressors with integral vibration isolators, and crankcase heaters which de- energize during compressor operation. Units shall also have:



## 15000 - Mechanical

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- I. Cylinder unloaders for capacity control, with minimum steps as scheduled;
  2. Thermal expansion valves, filter dryers, sight glasses, compressor service valves, liquid line service valves; minimum of 2 refrigerant circuits for units having 2 or more compressors; and fan-cycling control for low ambient control to 50 deg F (10 deg C).
- J. Safety Controls:
1. Low pressure cutout, manual reset;
  2. High pressure cutout, manual reset;
  3. Compressor motor overload protection, manual reset;
  4. Anti-recycling timing device;
  5. Adjustable low-ambient lockout;
  6. Oil pressure switch.
  7. Fire safety controls per NFPA-90A
- K. Heat Exchangers: Manufacturer's standard construction for gas- fired heat exchangers and burners, designed for minimum of 2-stage operation. Provide single gas connection.
1. Controls:
    - a. Redundant gas valves;
    - b. Intermittent pilot ignition;
    - c. Electronic spark ignition system;
    - d. High limit cutout;
    - e. Forced draft proving switch;
    - f. Flame roll-out switch
- L. Economizer Control: Return and outside air dampers, outside air filter, fully modulating electric control system with enthalpy control, and adjustable mixed-air thermostat. System shall have 100 percent outside air capability. Provide automatic changeover through adjustable enthalpy control device.
- M. Filters Section: 2" thick fiberglass throwaway filters in filter rack, with maximum face velocity of 300 fpm.
- N. Electrical: Units shall have a 115 VAC convenience outlet, separately fused, for unit service. Unit power connection shall be either through unit cabinet or within roof curb perimeter.
- O. Automatic Control: Roof Top Unit shall incorporate Automatic Control per sequence of operation shown in the drawings.
- P. Accessories: Units shall include the following accessories as indicated or scheduled:
1. Anti-recycling control to automatically prevent compressor restart for 5-minutes after shutdown.



2. Low ambient control head pressure control, designed to operate at temperatures down to 0 deg F (-18 deg C).
3. Thermostat: Assembly shall provide for staged heating and cooling with manual or automatic changeover on standard subbase.

### 3.0 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine areas and conditions under which rooftop units are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

#### 3.2 INSTALLATION

- A. General: install rooftop units in accordance with manufacturer's installation instructions. Install units plumb and level, firmly anchored.
- B. Support: Install and secure rooftop units on curb and coordinate roof penetrations and flashing.
- C. Electrical Connections: Refer to Section 16142 - Electrical Connections for Equipment for final connections to equipment and installation of loose shipped electrical components.

#### 3.3 DEMONSTRATION

- A. Start-Up Services:
  1. Provide the services of a factory-authorized service representative to start-up rooftop units, in accordance with manufacturer's written start-up instructions. Test controls and demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.
- B. Operating and Maintenance Training:
  1. Provide services of manufacturer's service representative to instruct Corpus Christi Army Depot personnel in operation and maintenance of rooftop units. Training shall include start-up and shut-down, servicing and preventative maintenance schedule and procedures, and troubleshooting procedures plus procedures for obtaining repair parts and technical assistance. Review operating and maintenance data contained in the Operating and Maintenance Manuals specified in Division One.

END OF SECTION 15770b



## SECTION 15772

### PACKAGED HEAT PUMPS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of air-cooled packaged heat pumps, including throughwall and roof top type units with supplemental electric heat. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Capacity and Performance shall be based on standard air density (0.075 pounds per cubic foot). Fans shall have a peak static efficiency of not less than 60 percent. Capacity ratings shall be in accordance with ARI Standards 240 and 270.
- 2.2 Casings shall have a corrosion protective coating. Casing shall have 1/2-inch thick minimum thermal insulation, and the compressor compartment shall have acoustical insulation.
- 2.3 Compressors shall be direct drive semi-hermetic with a maximum operating speed of 1,750 rpm. Each compressor shall have an independent refrigeration circuit with integral sub-cooling unit. Refrigerant accessories shall include a reversing valve and suction line oil/gas accumulator.
- 2.4 Evaporator Coils shall be copper tubing with aluminum fins. New coils shall be pressure and leak tested at 1.5 times the working pressure.
- 2.5 Filters shall be 2-inch thick throwaway type.
- 2.6 Condensers shall have copper tubes and aluminum fins. New condensers shall be leak tested at the factory at 1.5 times the working pressure. A separate direct drive fan shall be included for each refrigeration circuit.
- 2.7 Auxiliary Heating Coil shall be low watt density, fin-tubular construction, protected by thermal safety switches.
- 2.8 Controls shall provide for automatic switchover between cooling and heating cycles.
- 3.0 EXECUTION:
- 3.1 Welding shall be performed in accordance with AWS D1.1 and/or ASME Code Section IX.
- 3.2 Brazing shall be performed in accordance with ASME Code Section IX.
- 3.3 Damage to Galvanized Coatings shall be repaired with galvanized paint.

END OF SECTION 15772





## SECTION 15781

### HUMIDITY CONTROL EQUIPMENT

- 1.0 DESCRIPTION OF WORK: This section covers the furnishing and installation of humidifiers and dehumidifiers. Products shall match existing material and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
  - 2.1 Humidifiers shall be pneumatic modulating type.
    - 2.1.1 Steam Separator shall be designed to remove water droplets and particles larger than 3 microns when humidifier is operating at full capacity.
    - 2.1.2 Control Valve shall be stainless steel plug type with pneumatic operator.
    - 2.1.3 Distribution Manifold shall provide uniform dry steam distribution throughout its entire length.
    - 2.1.4 Strainer shall be Y-type.
    - 2.1.5 Steam Trap shall be as recommended by the manufacturer of the steam humidifier and shall be preceded by a drip leg.
  - 2.2 Dehumidifiers shall be free-standing self-contained plug-in type units that are UL listed.
    - 2.2.1 Components shall be housed in a portable 22-gauge steel cabinet.
    - 2.2.2 Capacity Ratings shall be in accordance with ANSI B149. Overflow cutoff control shall be provided.
- 3.0 EXECUTION:
  - 3.1 Steam Supply Manifold for humidifier shall be installed either perfectly level or extending upward vertically in duct. Discharge holes shall point upstream against airflow.
  - 3.2 Welding shall be performed in accordance with AWS D1.1 and ASME Code Section IX, where applicable.

END OF SECTION 15781



## SECTION 15810

### WARM AIR FURNACES

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of warm air furnaces. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
  - 2.1 New Furnace shall comply with the AGA Directory of Certified Appliances and Accessories, NFPA 70, and UL 296, 378, 499, 727, 795, and. 900 as applicable.
  - 2.2 Filters may be permanent, cleanable type or throw-away type and shall comply with requirements of UL 900. Face velocity of air at maximum flow rate shall not exceed 360 cubic feet per minute for standard velocity filters and 520 feet per minute for high velocity filters.
  - 2.3 Flues shall be double-walled and constructed of galvanized steel complying with ASTM A 526.
- 2.4 CONTROLS:
  - 2.4.1 Thermostats shall be low voltage type designed to operate on control circuits not exceeding 30 volts.
  - 2.4.2 Limit Control for Oil or Gas Furnaces shall be designed and installed to shut down the burner when the bonnet air temperature reaches 200 F. Differential shall be fixed at not less than 10 F and not greater than 25 F.
  - 2.4.3 Blower Control shall prevent operation of blower after burner has fired until the discharge air at bonnet reaches a predetermined temperature. Fan "on" setting shall be adjustable within range of 90 F to 140 F. Differential setting may be fixed between 24 F and 36 F or adjustable between 20 F to 50 F. Blower control shall. include manual switch.
- 2.5 GAS FURNACES:
  - 2.5.1 Gas Burners shall be of corrosion-resistant steel and shall be designed, adjusted, rated, and certified to fire natural, manufactured, mixed, or propane gas. Burners rated 400,000 Btu input or less shall be manually or electrically ignited, standing pilot type. Burners rated greater than 400,000 Btu input shall be electrically ignited, proven pilot type.
  - 2.5.2 Heat Exchangers shall be fabricated from steel complying with ASTM A 568.
  - 2.5.3 Gas Valves shall be provided with a safety shutoff that will, in the event of flame failure, cause safety shutdown of the burner; an automatic pilot; and except for furnaces firing propane gas, an automatic gas pressure regulator.
  - 2.5.4 Furnace Housings shall be constructed of not less than 22-gauge steel complying with ASTM A 424, with baked enamel coating.
- 2.6 OIL FURNACES:



## 15000 - Mechanical

- 2.6.1 Burners shall be of flange-mounted high pressure atomizing type. Burner ignition shall be by continuous, automatic, cadmium cell control. The burner shall incorporate an oil pump, burner motor, combustion air fan, and burner tube.
  - 2.6.2 Heat Exchangers shall be fabricated from cold-rolled steel - complying with ASTM A 568 with radiation shield and combustion chamber of stainless steel complying with ASTM A 167.
  - 2.6.3 Furnace Housings shall be constructed of not less than 22-gauge steel complying with ASTM A 424 with baked enamel coating.
  - 2.7 ELECTRIC FURNACES:
    - 2.7.1 Heater Elements shall be helically coiled, nickel-chromium wire, individually sequenced with individual thermal limit controls and fusible links for each element. Entire design shall be UL 499 listed and shall comply with NFPA 70.
    - 2.7.2 Furnace Housings shall be constructed of not less than 22-gauge steel complying with ASIM A 424 with baked enamel coating.
  - 3.0 EXECUTION:
    - 3.1 New Furnace shall be installed in accordance with UL 499, UL 727, or UL 795 as applicable.
    - 3.2 Welding shall be performed in compliance with AWS D1.1.
    - 3.3 Damage to Galvanized Coatings shall be repaired by application of galvanizing repair paint.
    - 3.4 Corroded Heat Exchangers shall be removed and replaced.
    - 3.5 Flue: Replace corroded sections of flue in compliance with UL 378.
    - 3.6 Controls: Replace defective controls in compliance with NFPA 70.
- END OF SECTION 15810



## SECTION 15821

### CENTRIFUGAL FANS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of centrifugal fans. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Fan Performance:
- 2.1.1 General: The volume of air delivered or exhausted, static pressure, speed, wheel diameter and brake-horse-power for each fan, together with the minimum horsepower and speed of its motor, shall be in accordance with the tabulations on the drawings.
- 2.1.2 New Fans shall comply with AMCA 210, 300, 301.
- Capacity and Performance of New or Repaired Fans shall be based on standard air density (0.075 pounds per cubic foot). Fans shall have a peak static efficiency of not less than 60 percent. Each fan shall be capable of delivering (or exhausting) the required air volume against the stipulated static pressure when developing not more than the brake-horsepower called for that unit. A decrease of five percent (5%) in fan wheel diameter will be accepted, provided that the resultant tip speed at stipulated air delivery is not exceeded by more than ten percent (10%) and the stipulated brake-horsepower is not exceeded. Outlet velocities shown on the drawings shall not be exceeded by more than five percent (5%).
- 2.2 Fan Wheel and Shaft:
- 2.2.1 Fan wheels for wall exhaust fans shall be constructed of aluminum complying with ASTM B 209. Steel for the fan wheels shall comply with ASTM A 366.
- 2.2.2 Fan Shaft shall be turned, ground, and polished carbon steel alloy.
- 2.2.3 Fan Shaft shall be tubular with swaged ends accurately finished.
- 2.3 Fan Housing:
- 2.3.1 Fan Housing shall be carbon steel sheet complying with ASTM A 569, except wall exhaust fan housings shall be spun aluminum complying with ASTM B 209.
- 2.3.2 When the fan discharge of the existing housing to be replaced is changeable, discharge of the new housing shall be easily changed in compliance with AMCA Bulletin 99.
- 2.4 Inlet Boxes: Steel for repairs shall be carbon steel sheet complying with ASTM A 569.
- 2.5 Bearings:
- 2.5.1 Precision Antifriction Bearings.



- 2.5.2 Sleeve Bearings shall be self-aligning sleeve bearings.
- 2.5.3 Roller Bearings shall be self-aligning, high load capacity, grease-lubricated, heavy-duty, pillow block type.
- 2.5.4 Wall Exhaust Fan Bearings shall be sealed-in lubrication, antifriction type adequate for both radial and trust loads occurring in the mounting.
- 2.6 Fan Belts shall comply with RMA Engineering Standards for Multiple V-Belt Drives. Belts for multiple-belt drives shall be installed in matched sets only.
- 2.7 Insulation in fan housing shall be mineral fiber: Adhesive shall be fire resistive adhesive.
- 2.8 Approved makes of centrifugal fans: Fans manufactured by Aladdin Heating Corp., American Standard Industrial Products Division, Barry Blower Co., Buffalo Forge Co., Champion Blower and Forge Co., Chicago Blower Corp., New York Blower Co., H.K. Porter Co., Inc. )Peerless, Sturtevant Division of Westinghouse Electric Co., Trane Co. or Zurn Industries, Inc. (Clarage Division) conforming with the requirements of the drawings, specifications, and job conditions will be approved.
- 3.0 EXECUTION:
- 3.1 Balancing: Centrifugal fan wheels, repaired or new, shall be balanced statically and dynamically.
- 3.2 Welding shall be performed in compliance with AWS D1.1.
- 3.3 Damage to Galvanized Coatings shall be repaired by application of galvanizing repair paint.
- 3.4 Shop Drawings: HVAC Contractor shall submit detail drawings of all types of fans, prepared by the respective manufacturers. These detail drawings shall show complete compliance with the drawings and the specifications.

END OF SECTION 15821



## SECTION 15827

### AXIAL FLOW FANS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of axial flow fans. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
  - 2.1 Capacity and Performance shall be based on standard air density (0.075 pounds per cubic foot). Fans shall have a peak static efficiency of not less than 60 percent. New fans shall comply with AMCA 210, 300, and 301.
  - 2.2 Fan Wheel repair material shall be sheet aluminum complying with ASTM B 209. New wheels shall be of airfoil design and shall be statically and dynamically balanced at the factory.
  - 2.3 Fan Shafts shall be turned, ground, and polished steel of suitable size to operate well below first critical speed.
  - 2.4 Fan Housing shall be 22 gauge, welded carbon steel complying with ASTM A 569.
  - 2.5 Propeller Guards, when required, shall be sheet metal complying with ASTM A 366 or hot-dip galvanized wire complying with ASTM A 641.
  - 2.6 Bearings shall be sealed-in lubrication, anti-friction type adequate for both radial and thrust loads occurring in the mounting.
  - 2.7 Fan Belt shall comply with RMA Engineering Standards for Multiple V-Belt Drives. Belts for multiple-belt drives shall be installed in matched sets only. Belt guards shall comply with OSHA.
  - 2.8 Insulation in fan housing shall be mineral fiber. Adhesive shall be fire resistive.
- 3.0 EXECUTION:
  - 3.1 Welding shall be performed in compliance with AWS D1.1.
  - 3.2 Damage to Galvanized Coatings shall be repaired by application of galvanizing repair paint.

END OF SECTION 15827



## SECTION 15830

### POWER ROOF VENTILATORS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of power roof ventilators. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
  - 2.1 PRV Performance:
    - 2.1.1 New PVRs shall comply with AMCA 210, 300, and 301.
    - 2.1.2 Capacity and Performance of new and repaired PRVs shall be based on standard air density (0.075 pounds per cubic foot). Fans shall have a peak static efficiency of not less than 60 percent.
  - 2.2 Fan Wheel shall be centrifugal, axial flow, or turbine type, non-overloading, constructed of aluminum complying with ASTM B 209.
  - 2.3 Fan Shaft shall be turned, ground, and polished steel of suitable size to operate well below first critical speed.
  - 2.4 Bearings shall be sealed-in lubrication, anti-friction type adequate for both radial and thrust load occurring in the mounting.
  - 2.5 Fan Housing shall be spun aluminum complying with ASTM B 209. The housing shall be weatherproof with 360 degrees discharge air pattern.
  - 2.6 Fan Belt shall comply with RMA Engineering Standards for Multiple v-Belt Drives. Belts for multiple-belt drives shall be installed in matched sets only."
  - 2.7 Insulation in fan housing shall be mineral fiber complying with Fed. Spec. HH-I-58, Fonn B, Type 1. Adhesive shall be fire resistive adhesive complying with Mia. Spec. MIL-A-3316.
  - 2.8 Roof Curb shall be prefabricated, with continuous welded watertight seams. The curb shall be of the roofed-over, flashing type, with built-in cant strip.
  - 2.9 Back Draft Dampers for installation in the roof curb shall be multiple blade type, constructed of aluminum complying with ASTM B 209.
- 3.0 EXECUTION:
  - 3.1 Balancing: Centrifugal fan wheels, repaired or new, shall be balanced statically and dynamically. Propeller fans shall be statically balanced.
  - 3.2 Welding shall be performed in compliance with AWS D1.1
  - 3.3 Damage to Galvanized Coatings shall be repaired by application of galvanizing repair paint in compliance with Mil Spec. DOD-P-21035.



## 15000 - Mechanical

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END OF SECTION 15830





## SECTION 15834

### AIR HANDLING UNITS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of air handling both single and multi-zone units. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS: Built-up air handling units (AHUs) shall consist of casings, fan sections, coils, filter boxes, mixing boxes, dampers, zoning dampers and other equipment as required. All AHUs shall be certified in accordance with ARI Standard 430. Coils shall be certified in accordance with ARI Standard 410. Electric heating coils shall meet the requirements of UL and the National Electric code. AHUs shall also conform to the requirements of NFPA 90A and all applicable SMACNA standards.
- 3.0 EXECUTION:
  - 3.1 Air Handling Units shall be installed to conform with NFPA 90A and applicable SMACNA standards.
  - 3.2 Welding shall be performed in compliance with AWS D1.1.
  - 3.3 Casing for unit shall be fabricated of steel, well reinforced with angle or channel shapes to provide a rigid structure. "Pan type" construction may also be accepted, subject to approval by the Contracting Officer. Removable steel panels shall be provided to furnish easy access to all internal equipment. Units installed in fan rooms, pipe and duct spaces, etc., may have galvanized steel finish. Those installed in finished areas shall be protected with a rust inhibitive paint and finished with oven baked enamel applied after bonderizing.

END OF SECTION 15834



## SECTION 15840

### DUCTWORK AND ACCESSORIES

- I.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of ductwork and accessories. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
- 2.1 Metal Duct and Equipment Casings, Housing, and Plenums shall be fabricated in accordance with SMACNA Low Pressure Duct Construction Standards, Medium Pressure Duct Construction Standards or High Pressure Duct Construction Standards, as applicable, and shall comply with NFPA 90A, 90B, and 91, Metal gauge shall generally be in accordance with SMACNA standards or as listed, but in no case shall be less than existing duct gauge.
- 2.1.1 Galvanized Sheet Steel:
- A. Lock-forming quality; ASTM A 653/A 653, G90 (Z275) coating designation; mill-phosphatized finish for surfaces of ducts exposed to view.
  - B. Any rust spots that may develop along seams or at joints shall be painted with one coat of zinc chromate or red oxide paint.
  - C. Furnish and install a neoprene gasket, 1/4-inch thick, full width of flange, wherever a galvanized duct connects with an aluminum O.A.I. collar.
- 2.1.1.1 Gauge of Metal
- Galvanized steel sheets for ducts, etc., shall be in accordance with the following table:
- |   |              |
|---|--------------|
| up to 30-inches (either dimension)        | No. 24-gauge |
| 30-inches to 54-inches (either dimension) | No. 22-gauge |
| 54-inches to 72-inches (either dimension) | No. 20-gauge |
| 72-inches and over (either dimension)     | No. 18-gauge |
| Warming Pantry hood exhaust duct          | No. 16-gauge |
| Dampers                                   | No. 16-gauge |
- Note: Gauges of metal for ducts which connect to the Warming Pantry hood exhaust duct shall be as regularly specified.
- 2.1.2 Black Steel shall comply with ASTM A 569.
- 2.1.3 Aluminum Ductwork: When aluminum ducts are indicated on the drawings, the construction or the aluminum ducts shall be similar to the construction of galvanized steel ducts as specified in this



Section, except that the sheets shall be type 2S aluminum. Hangers and braces shall be of galvanized steel. Ducts whose larger dimension is 12-inches or less shall be fabricated from No. 24-gauge aluminum; from 13-inches through 30-inches shall be No. 22-gauge; from 31-inches through 54-inches shall be No. 20-gauge; from 55-inches through 84-inches shall be No. 18-gauge; over 84-inches shall be No. 16-gauge. Where an aluminum duct is to be joined to a galvanized steel duct, the end of the galvanized duct shall be coated with black asphaltum paint before it is connected to the aluminum duct.

NOTE: All joints and seams in Shower Room exhaust duct-work shall be made watertight by the use of a suitable sealant. Longitudinal seams shall not be located at bottom of duct.

- 2.1.4 Stainless Steel Ductwork: Where stainless steel ductwork is indicated on the drawings, it shall be fabricated from Type 304 (18/8) stainless steel sheets with standard mill finish. Rods, angles, and other structural shapes used in connection with stainless steel sheets shall be of stainless steel. Gauges of stainless steel sheets used for ductwork shall be the same as those specified for galvanized steel sheets in Par. 2.1.1.1.
- 2.2 Fibrous Glass Duct shall be fabricated in accordance with SMACNA Fibrous Glass Duct Construction Standards.
- 2.3 Flexible Duct shall be in accordance with NFPA 90A and SMACNA Flexible Duct Performance and Installation Standards and shall be UL listed.
- 2.4 Flexible Connectors shall be in accordance with NFPA 90A and shall be UL listed.
- 2.5 Sealants shall be in accordance with SMACNA High Pressure Duct Construction Standards.
- 2.6 Hangers and Supports:
  - A. All ducts shall be run at the levels indicate on the drawings, as close to the ceiling as possible, except in where pipes or electric conduits are indicated as passing above them. They shall be installed within the enclosing work (hung ceiling or furring) shown on the drawings and shall not interfere with its construction. Runout necks shall be brought out at the heights shown on the drawings. Horizontal ducts shall be supported on galvanized steel hangers. For ducts having a cross-sectional area of 4-square feet or less, the hangers shall be located near each duct joint and shall be spaced not more than 8-feet apart. For ducts having a cross-sectional area greater than 4-square feet, the hangers shall be located near each duct joint and duct brace, and shall be spaced not more than 4-feet apart. Where one duct is run below another duct of greater width, the lower duct shall be hung from the braces of the upper duct by means of strap hangers bolted to the braces of the upper duct. The braces of the upper duct shall be increased in thickness in such cases.
  - B. Copper ducts shall be supported from copper hangers, or from galvanized hangers insulated with a thick coat of black asphaltum paint.
  - C. 1. When the floor and/or roof slab construction for the project is of conventional reinforced poured concrete type, the following directions apply: Overhead ductwork shall be supported by hangers secured to inserts installed by the Contractor before the floor slabs are poured. Attachment of hangers to existing slabs of this type of construction shall be made with B.S. and A. approved self-drilling concrete anchors. They shall be the equal of Molly Co.'s "Parabolt", Phillips Co.'s "Red Head" or Rawl-plug Co.'s "Saber Tooth".



## 15000 - Mechanical

2. When the floor and/or roof slab construction for the project is the composite metal deck type, consisting of corrugated sheet steel and reinforced concrete, the following directions apply: Overhead ductwork shall be supported by hangers secured to beam clamps or to steel deck inserts. Steel deck inserts shall be of a type that is supported by the concrete slab and not by the metal deck. They shall be the equal of Phillips Drill Co.'s "Red Head" Steel Deck Inserts. Submit shop drawings for approval.

- D. Vertical ducts shall be supported at each floor level with steel angle braces extending around duct and with an end of an angle extending beyond duct and resting on the floor construction at each corner of the duct. Supporting angles shall be 1 x 1 x 1/8-inch for ducts up to 30-inches (in either dimension ). 1 1/4 x 1 1/4 x 1/8-inch from 30 to 60-inches and 1 1/2 x 1 1/2 x 1/8-inch 60-inches and above.
- E. The steel angle braces about the flues terminating in a louvered penthouse shall be coated with plastic roofing cement after installation, so as to make the opening through the roof slab around the flues water tight.

2.7 Ductwork Accessories shall be in accordance with SMACNA Duct Construction Standards.

3.0 EXECUTION:

3.1 Ductwork: Damaged sections of duct shall be repaired by patching or by replacing complete sections. Work shall comply with the applicable sections of SMACNA Low Pressure Duct Construction Standards, High Pressure Duct Construction Standards, and NFPA 90A, NFPA 90B, or NFPA 91.

3.1.1 Methods of Installation: Care shall be exercised so as not to run ducts in the spaces allocated to pipes of electric conduits. Ducts shall be run at the elevations indicated on the drawings. Proper clearances shall be provided for the swing of doors, lighting fixtures, etc. Ducts shall be concealed where so indicated. Where the corner of an angle iron brace or joint member projects into a walking passage, the corner shall be mitered and shall be padded with 1/2-inch minimum thickness flexible foamed plastic material to minimize the possibility of injury to personnel.

3.1.2 Identification: Where the outside air intake for a supply fan system is isolated from the fan it serves, the connecting duct shall be identified at the intake. Identification shall consist of a 1/8-inch thick laminated plastic plate, with 1/2-inch white core letters, designating the system it supplies. Plated shall be secured to the wall adjacent to the intake.

3.2 Flame Cutting: No cutting by torch or flame shall be done without authorization from the Contracting Officer.

3.3 Welding shall be performed in compliance with AWS D1.1.

3.4 Heat and Smoke Detection Devices:

- A. HVAC Contractor shall install heat detecting devices and smoke detecting devices in the ductwork at various locations, as indicated on the drawings. Provide a 12" x 12" access floor in the duct near each detector. These detecting devices will be furnished by the Contractor who will provide all wiring connections. HVAC Contractor shall operate the fans of the ventilating systems concerned, for the purpose of testing the heat and smoke detectors when so requested.



## 15000 - Mechanical

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- B. HVAC Contractor shall inform the Contractor of the proper temperature setting required for each heat detector. This temperature shall be approximately 40° F . (but not more than 50° F.) higher than the operating temperature of the system in which the heat detector is located.

END OF SECTION 15840



## SECTION 15851

### TAILPIPE EXHAUST EQUIPMENT

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of tailpipe exhaust equipment. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
  - 2.1 Capacity and Performance shall be based on standard air density (0.075 pound per cubic foot). Fans shall have a peak static efficiency of not less than 60 percent.
  - 2.2 Blowers and Accessories shall comply with AMCA 210, 300, and 301. Fan impellers shall be constructed of heavy gauge steel and accurately balanced both statically and dynamically when installed in the assembled fan unit. Impeller and housing in the air stream shall be coated with neoprene, epoxy, phenolic resins, or other material suitable to resist the corrosive gases and temperatures encountered. Fans to be mounted on exterior of building shall be provided with weatherproof covers.
  - 2.3 Exhaust Duct and Fittings for vehicle tailpipe exhaust systems shall be constructed of galvanized sheet steel. Sheets shall conform to ASTM A 525. Ductwork shall be constructed with minimum metal gauge thickness and reinforced as required in the SMACNA High Pressure Duct Construction Standards.
    - 2.3.1 Tailpipe Adapter shall be not less than 20-gauge corrosion-resisting steel. The adapter shall be of the tapered cone type with spring clip or other suitable device for exhaust pipe attachment.
    - 2.3.2 Flexible Exhaust Tubing shall be 0.012 minimum thickness galvanized sheet steel or heat-resistant, reinforced wire, fiberglass, and neoprene tubing,
    - 2.3.3 Dampers shall be of the circular disk type with quadrant locking device or blast gate type.
    - 2.3.4 A Flexible Tubing Suspension System shall be furnished and installed for repaired tailpipe exhaust systems where no such suspension system exists. The flexible tubing suspension system shall suspend the flexible tubing overhead when not in use, allowing it to be lowered to the operating level, when required. The suspension system installed shall be complete with cable, pulleys, and operating mechanism.
- 3.0 EXECUTION:
  - 3.1 Ductwork joints in galvanized sheet steel ductwork shall be soldered or otherwise sealed. The lock seam in straight sections shall be located on top of the duct. Seams shall be suitable for 10-inch water gauge static pressure. Ductwork shall be constructed with minimum metal gauge thickness and reinforced as required in the SMACNA High Pressure Duct Construction Standards.
  - 3.2 Weather-Resistant Finishes of items located outdoors shall meet the requirements of ASTM B 117.



END OF SECTION 15851



## SECTION 15855a

### BREECHING

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of breeching. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
- 2.1 Metal Breeching:
- 2.1.1 Carbon Steel shall comply with ASTM A 568.
- 2.1.2 Galvanized Steel shall be carbon steel complying with ASTM A 123.
- 2.1.3 Stainless Steel shall comply with ASTM A 167.
- 2.1.4 High Heat Insulating Refractory shall be an alumina-silica-base castable refractory complying with ASTM C 64.
- 2.1.5 Acid Resistant Liner shall be phenolic, rubber, and polyester resin liner.
- 2.1.6 Insulation: Calcium silicate block type insulation shall comply with ASTM C 533. Mineral fiber insulation shall be block type complying with ASTM C 612, Class 1.
- 2.1.7 Bolts and Nuts: Where breeching is connected to stack by means of a flange, bolts shall be high temperature alloy steel bolts complying with ASTM A 193, with hex nuts complying with ASTM A 194.
- 2.1.8 Paint for prime coats and finish coats for touchup or refinishing shall be of the high heat-resistant type.
- 2.2 Masonry:
- 2.2.1 Mortar and Grout for repair of cracks in reinforced concrete shall comply with ASTM C 476. Mortar for use in the repair or replacement of brick lining in high heat breeching shall be ground fire clay complying with ASTM C 105. Chemical-resistant mortar shall be resin mortar complying with ASTM C 395.
- 2.2.2 Brick for lining of high heat breeching requiring acid resistance shall be refractory brick complying with ASTM C 64. Brick for breeching requiring acid resistance shall be chemical-resistant brick complying with ASTM C 279, type H.
- 2.2.3 Inspection Doors shall be heavy-duty cast iron or steel, lined on interior with insulating, castable refractory complying with ASTM C 64.
- 2.2.4 Insulation: Calcium silicate block type insulation shall comply with ASTM C 533. Mineral fiber insulation shall be block type complying with ASTM C 612, Class 1.
- 2.3 Refractory Brick:





- 2.3.1 Brick shall be high heat refractory type complying with ASTM C 64.
- 2.3.2 Mortar: Fire clay mortar shall be of high heat, ground type complying with ASTM C 105. Chemical-resistant mortar shall be the silica type complying with ASTM C 466.
- 2.3.3 Refractory shall be of the insulating, castable type complying with ASTM C 64. Chemical-resistant type castable refractory shall be in compliance with ASTM C 401.
- 2.3.4 Inspection Doors shall be heavy-duty cast iron or cast steel, lined on the interior with insulating castable refractory complying with ASTM C 64.
- 3.0 EXECUTION:
- 3.1 Flame Cutting: No cutting by torch shall be done without authorization from the Contracting Officer
- 3.2 Welding: All welding shall be performed in compliance with AWS D1.1.
- 3.3 Installation of Breechings shall be in compliance with NFPA No. 211.

END OF SECTION 15855a



## SECTION 15855b

### STACKS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of stacks. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Metal Stacks:
- 2.1.1 Carbon Steel shall comply with ASTM A 568.
- 2.1.2 Galvanized Steel shall be carbon steel complying with ASTM A A 568, galvanized in compliance with ASTM A 123.
- 2.1.3 Stainless Steel shall comply with ASTM A 167.
- 2.1.4 Insulating Refractory shall be alumina-silica base castable refractory complying with ASTM C 64.
- 2.1.5 Acid Resistant Liner shall be phenolic, rubber and polyester resin liner.
- 2.1.6 Insulation: Calcium silicate block type insulation shall comply with ASTM C 533. Mineral fiber insulation shall be block type complying with ASTM C 612, Class I.
- 2.1.7 Insulation Jacket: Canvas jacket shall be 8-ounce standard proprietary canvas jacket. Aluminum jacket shall be 0.016 inch thick, corrugated, embossed or smooth, complying with ASTM B 209, temper H14, Type 3003 or 5010, with 50 pound polyethylene vapor barrier. Supports for aluminum jacket shall be stainless steel Z-clips and bands 0.016 inch thick by 3/4 inch wide.
- 2.1.8 Bolts and Nuts: Where breeching is connected to stack by means of a flange, bolts shall be high temperature alloy steel bolts complying with ASTM A 193, with hex nuts complying with ASTM A 194.
- 2.1.9 Steel rivets shall comply with ASTM A 502.
- 2.1.10 Steel Structural Wire Rope shall be zinc-coated and shall comply with ASTM A 603.
- 2.1.11 Paint For Prime Coats and Finish for touchup or refinishing shall be of the high-heat-resistant type.
- 2.2 Masonry Stacks:
- 2.2.1 Ceramic Glazed Clay Brick shall comply with ASTM C 126.
- 2.2.2 Chemical-Resistant Masonry Units shall comply with ASTM C 279.
- 2.2.3 Castable Refractory shall comply with ASTM C 401.
- 2.2.4 Mortar for Fireclay Brick shall comply with ASTM C 105. Mortar for chemical-resistant applications shall comply with ASTM C 395. Mortar and grout for reinforced masonry shall comply with ASTM C 476.



## 15000 - Mechanical

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- 2.3 Prefabricated Stacks shall consist of double-wall vent pipe and fittings. All components shall be UL listed and shall comply with NFP 211.
- 3.0 EXECUTION:
- 3.1 Installation or Repair of all stacks shall be in accordance with NFPA 211.
- 3.2 Flame Cutting: No cutting by torch shall be done without authorization from the Contracting Officer.
- 3.3 Welding: All welding shall be performed in compliance with AWS D1.

END OF SECTION 15855b



## SECTION 15866

### DRAFT CONTROL EQUIPMENT

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of draft control equipment. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
- 2.1 Structural Steel shall comply with ASTM A 36.
- 2.2 Steel Pipe shall comply with ASTM A 53.
- 2.3 Piping Components shall comply with ASTM A 105.
- 2.4 Flanges, Fittings, and Valves shall comply with ASTM A 181.
- 2.5 Seamless Copper Tube shall comply with ASTM B 75.
- 2.6 Insulation shall comply with ASTM C 517 and ASTM C 547.
- 2.7 Thermal Insulation and Finishing Cement shall comply with ASTM C 449.
- 2.8 Welding and Brazing Materials shall be as specified in Section II of the ASME Boiler and Pressure Vessel Code.
- 3.0 EXECUTION:
- 3.1 Safety: Adequate natural or forced ventilation shall be provided during repair activities conducted in confined spaces. Forced or induced draft fans shall be rendered inoperable before performing internal repairs to the fan casing or adjacent ductwork.
- 3.2 Repairs shall be accomplished in compliance with NFPA No. 70.
- 3.3 Welding and Brazing shall be performed in accordance with Section IX of the ASME Code.
- 3.4 Drive Train Components shall be repaired or replaced to transmit power free from vibration at the required torque.
- 3.5 Sequence of operations:
- 3.5.1 During the period when there is no call for burner operation by the boiler pressure operating control, the breeching damper shall be maintained in the safe closed position. Safe closed position shall be understood to mean that the damper blade shafts have been rotated approximately 70 degrees from the fully open position.
- 3.5.2 When the boiler pressure operating control calls for burner operation, the following sequence of operation shall take place:



## 15000 - Mechanical

1. Breeching damper shall move to safe starting position, which shall be adjustable in the field. Forced draft fan and, where provided, induced draft fan shall start. After 30-second (minimum) pre-purge period, safe starting draft must be proven in combustion chamber before light off can take place.
2. Forced draft fan and induced draft fan shall be controlled through auxiliary fan relay in burner control panel.
3. As soon as safe starting draft is established, the flame failure control shall go through normal sequence of pilot ignition, pilot proving, main flame ignition and proving. When main flame is proved, draft controller shall modulate to maintain constant combustion chamber draft, within .01" W.C. of adjustable setting, regardless of firing rate or atmospheric conditions.
4. When boiler pressure operating control is satisfied, flame failure control shall de-energize the oil solenoid valve, shutting off main flame. Forced draft fan and induced draft fan shall continue to run for 10-second (minimum) post purge period. During this period, breeching damper shall remain open to permit venting of gases.. After completion of post purge period, breeching damper shall move to safe closed position.
5. At any time during an operating cycle, if the draft in the combustion chamber should fail for any reason, a signal light in the draft controller shall so indicate and if draft is not re-established within 5 to 7 seconds, the burner shall be shut down.
6. In case of flame failure, burner shall shut down and breeching damper shall move to safe starting position to permit venting of unburned gases. Burner and fan motors shall shut down with burner lockout. Draft sequence controller shall re-cycle after reset of flame failure control.
7. In case of a power failure or any other cause of shutdown, the breeching damper shall move to the safe starting position before the burner can be started.

END OF SECTION 15866



## SECTION 15871

### DIFFUSERS AND GRILLES

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of diffusers and grilles. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Air Diffusers:
- A. Air diffusers shall be of the circular or rectangular type as indicated on the drawings and shall be of the size to deliver the cubic feet of air per minute required. Diffusers shall be made of heavy gauge aluminum or steel as specified herein: Where diffusers are to be installed in a room with an unpainted aluminum pan ceiling, the diffusers shall be aluminum with clear satin anodized finish. In all other cases, the diffusers shall be of steel with baked enamel finish in a color as selected. Adjustments shall be made of heavy steel.
  - B. Each circular and rectangular diffuser shall be provided with equalizing deflector vanes and with a splitter damper for volume control. Splitter damper shall be operable from the face of the diffuser.
  - C. Each diffuser shall be securely fastened to its connecting neck by means of 4 screws equally spaced around the collar. Contractor shall furnish and install proper size No. 14-gauge galvanized steel frames for the air diffusers to be installed in plaster hung ceilings.
  - D. Each air diffuser installed in a gymnasium or Playroom shall be equipped with a shallow dome-shaped guard constructed of No. 9-gauge cold rolled steel wire. Guard for circular diffuser shall be fabricated of concentric rings spaced on 3/4-inch centers with radial wire stiffeners spaced at 45° and electrically welded to the concentric rings. Guards for rectangular diffusers shall be constructed of same gauge wire and in a manner similar to that specified for circular guards, except that they shall be rectangular in shape. A 2-inch diameter opening shall be provided in the center. Complete guard shall be electro-cadmium or zinc plated. Guard shall be secured to air diffuser with plated steel clamps and stainless steel machine screws and nuts.
- 2.1.1 Air diffusers manufactured by the Anemostat Corp., Krueger Mfg Co., Titus Mfg. Co., Tuttle and Bailey or other approved equal will be accepted. Submit shop drawings of diffusers and guards for approval.
- 2.2 Grilles, Frames, Etc.
- A. General requirements
    - 1. All grilles required for HVAC work, together with frames to receive them, shall be furnished by the Contractor. Grilles shall be of the dimensions shown on the drawings which shall mean the inside frame dimensions and shall not include the border of the grille. the



Contracting Officer reserves the right to require grilles to be of such dimensions that will conform with the architectural treatment of the building, providing that no change is made in the net grille area shown.

2. Type "A" frames for grilles shall be made in accordance with the applicable building codes. Frames shall be given a prime paint coat at the shop.
3. Grilles for convector enclosures shall be as specified in Section 15745.
4. Grilles indicated on the drawings to be installed in pan type hung ceilings shall be fabricated of aluminum and shall be designed for installation without frames in that type of ceiling.
5. Unless otherwise indicated, grilles shall be solid steel bar type having straight bars without waves or sharp edges, evenly spaced. Ends of grille flanges (borders) shall be turned down, and a rubber gasket shall be cemented all around the back. Contractor will submit to the Contracting Officer for approval drawings indicating size, thickness and spacing of bars, size and thickness of flanges, method of fastening, etc. Grilles shall be given a prime paint coat at the factory.

### 2.2.1 Exhaust Grilles:

Exhaust grilles shall be equipped with an opposed blade or multi-shutter volume control device of steel, with the blades linked to operate in unison. This device shall be attached to the back of the grille flange, and shall be adjustable for required air volumes by use of a screw driver, Allen wrench, (or other approved means) through the front face of the grille.

### 2.2.2 Supply Grilles:

- A. The volume of air delivered through each supply grille shall be controlled as follows: Where the branch duct connection is more than 2-feet long, an opposed blade volume control shall be secured to the back of the grille flange. Where the branch duct connection is 2-feet long (or less), an air turning device shall be located at the branch duct connection, and an opposed blade volume control shall be secured to the back of the grille flange. Each opposed blade volume control shall have its blades linked so as to operate in unison. Volume control shall be adjustable for required air volumes by use of a screw driver, Allen wrench, (or other approved means) through the front face of the grille. Air turning device shall be Independent Register Co.'s "Airtrol", Krueger Manufacturing Co.'s Series VC8, Titus Manufacturing Corp. "Air Guide AG-25", Tuttle and Bailey's "Santrol" or other approved equal. Blades of air turning devices shall be installed horizontally for vertical ducts, and vertically for horizontal ducts.
- B. Where fixed deflecting type grilles are shown on the drawings, they shall have the bars fixed at the factory for types of deflection indicated on the drawings.
- C. Adjustable Deflecting Type Grilles

Where adjustable deflecting type grilles are shown on the drawings, they shall be constructed so that the bars can be adjusted to such positions as to produce the distribution of the air called for on the drawings. Where the drawings indicate a grille to be adjustable horizontally and vertically, the grille shall have a double core with the bars of each core adjustable. In lieu of the foregoing, a grille with 45° fixed deflecting bars arranged to direct the air equally in two opposing directions and having individually adjustable vanes located behind and perpendicular



## 15000 - Mechanical

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to the direction of the front bars may be accepted. Furnish 4 adjusting tools and deliver them to the Contracting Officer's staff.

### 2.2.3 Fire Damper Grille:

Where the drawings indicate a fire damper grille (F.D.Gr.) to be installed, Contractor shall supply a grille, an interlocking blade type fire damper and a volume control device, all assembled and installed as detailed on the drawing. Fire dampers shall be DOE approved and shall be so labeled. Grille shall be as specified in 2.2.6. Volume control shall be as specified in 2.2.1 or 2.2.2.

### 2.2.4 Grilles of other Material:

When grilles of other materials are indicated they shall in all respects, be as specified herein before, except that the material used shall be of the kind indicated in the scope of work. Thickness of metal shall be not less than the thickness of steel. Aluminum grilles shall have satin anodized finish. Aluminum grilles shall have aluminum volume controls.

### 2.2.5 Special Registers:

When "special registers" are shown on the drawings, they each shall consist of a grille and a volume control attached to the grille. Suitable means shall be provided for operating the volume control from the room by means of a chain or a key operated device. Four keys shall be delivered to the Contracting Officer's staff.

### 2.2.6 The following make, number and type grilles may be approved, provided they meet the specified requirements:

1. Independent Register Co.:
  - a. Supply: 311-OB, 321-OB
  - b. Exhaust: 311-OB or HMV, 321-OB or HMV
  - c. Special register: 311-OB CO or HMV CO, 321-OB CO or HMV CO
2. Titus Manufacturing Co.:
  - a. Supply: SNYGL-3
  - b. Exhaust: ENYGS-3
  - c. Special register: ENYGL-3CO
3. Tuttle & Bailey:
  - a. Supply: T-117 G
  - b. Exhaust T-117 G
  - c. Special register: SPL 40G OBD

## 3.0 EXECUTION

### 3.1 Detailed shop drawings of all types of grilles and accessories being furnished, and a schedule of their sizes, types and locations shall be approved by the Contracting Officer before grilles are shipped from the factory.





- 3.2 Furnish and install tell-tale streamers at all supply grilles and diffusers throughout the building. Streamers shall be 6-inches long x 1/2-inch wide, made of dark brown ribbon and shall be installed at the height directed. Steamers shall be put in position while dampers are being adjusted.
- 3.3 Testing and Balancing:
- A. The Contractor shall adjust the flow of air in the ducts by regulating the dampers, or shutters behind grilles, etc. to provide the volume of air called for on the drawings to be discharged into and withdrawn from each room. In making such adjustments, the velocity of the air shall be measured with an anemometer or velometer at the openings of the supply ducts and exhaust ducts in each room throughout the building and also, as may be necessary in the main ducts of the supply and exhaust systems. Deflecting type grilles shall be adjusted to distribute the air in the manner indicated on drawings.
  - B. Air Delivery
    - 1. Each supply fan and each exhaust fan shall be tested for required performance. The amount of air delivered or exhausted through each diffuser, grille or opening shall be measured under the following conditions:
      - (a) In exterior rooms having exhaust ventilation only: open windows and close door.
      - (b) In interior rooms having exhaust ventilation only: close door.
      - (c) In rooms having supply and exhaust ventilation: close doors and windows and operate supply and exhaust fans.
  - C. The amount of air passing through each opening shall be not less than that marked on drawings for the respective outlets, nor shall it exceed such amount by more than ten percent (10%) in any case. Readings shall be taken in accordance with ASHRAE standards, and shall be of at least 30 seconds duration. Individual readings across the face of the grille shall not vary from the total required air quantity by more than ten per cent (10%). After damper settings have been approved by the Contracting Officer, the Contractor shall mark the positions of dampers with painted lines as directed.
  - D. The operation of electric motors as may be required for the proper adjustment of duct dampers, etc., and the conduct of the above tests, will be permitted without charge to the Contractor for electricity consumed during such operation, provided, however, that this testing and adjustment is carried on during such times as approved.
  - E. Tests shall be conducted in accordance with the requirements of the Corpus Christi Army Depot regarding controlled inspection of ventilation systems. Furnish to the Contracting Officer four (4) copies of an air reading schedule, signed by the person performing the tests, showing the quantities of air passing through diffusers, grilles and main supply and exhaust ducts. Schedule shall list each room or space, size of grilles and diffusers therein, design cfm and actual cfm measured, averaged velocity through each terminal, and design and actual cfm of each air moving device. Schedule shall also indicate the actual static pressure of each system, rated and actual amperage of each fan motor, and the rated and actual speed of each fan.

END OF SECTION 15871



## SECTION 15880

### AIR CLEANING DEVICES

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of air cleaning devices. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance With the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
2. PRODUCTS :
- 2.1 Throwaway Panel Filters shall be constructed of glass, paper, or fabric media with a UL listing of Class 2 and shall be 1 or 2 inches thick as required. The filters shall have an initial resistance not greater than 0.30 inch w.g. at a face velocity of 500 fpm.
- 2.2 Extended Surface Self-Supporting Filters shall be constructed of UL-listed Class 1 or Class 2 fibrous media, integral media support, and a rigid galvanized steel frame, Nominal thickness shall be 12 inches. Filter dust spot efficiency shall be "rated in accordance with ASHRAE 52 Test Standard.
- 2.2.1 Filters Rated at 60-65 Percent Dustspot Efficiency shall have an initial resistance not greater than 0.50 inch w.g. at 500 fpm face velocity.
- 2.2.2 Filters Rated at 80-85 percent Dustspot Efficiency shall have an initial resistance not greater than 0.60 inch w.g. at 500 fpm face velocity.
- 2.2.3 Filters Rated at 90-95 Percent Dustspot Efficiency shall have an initial resistance not greater than 0.70 inch w.g. at 500 fpm face velocity.
- 2.3 Extended Surface Non-Supported Filters shall be constructed of UL listed Class 1 or Class 2 fibrous media. Individual bags shall be retained by a galvanized steel frame. Filter dustspot efficiency shall be rated in accordance with ASHRAE 52 Test Standard.
- 2.3.1 Filters Rated at 60-65 Percent Dustspot Efficiency shall have an initial resistance not greater than 0.35 inch w.g. at 500 fpm face velocity.
- 2.3.2 Filters Rated at 80-85 Percent Dustspot Efficiency shall have an initial resistance not greater than 0.45 inch w.g. at 500 fpm face velocity
- 2.3.3 Filters Rated at 90-95 Percent Dustspot efficiency shall have an initial resistance not greater than 0.55 inch w.g. at 500 fpm face velocity.
- 2.4 Automatic Renewable Roll Filters
- 2.4.1 General
- A. Except for media support brackets and the media, roll filters shall be completely factory assembled. The arrangement of the filter media rolls shall be such that either the rolls are fully enclosed, or the outside surface of the clean roll becomes the air entering side as the media passes through the air stream and this surface is wound facing inward on the dirty roll. the filter



media shall be so supported and confined in side tracks, that there will not be any leakage of unfiltered air. All metal surfaces exposed to the air stream shall be of galvanized steel construction. Inlet and outlet ends of the casing shall be drilled to facilitate duct work connections. Each filter shall be provided with an identification plate, mounted in a location where it will be readily visible after installation. The plate shall show serial number, model number, and all other data necessary for ordering renewal media.

- B. All internal wiring shall be factory installed and in accordance with the applicable Code. Electric motor shall comply with the requirements of 15B-16 and shall be equipped with built-in thermal overload protection. A jogging switch shall be provided and wired into the control circuit. Field wiring shall consist of service wiring to terminals on the control panel, and wiring between the control panel and the media runout signal light. Contractor will provide service wiring to the control panel and will install and wire to the signal light at a location on the exterior of the casing. Signal light shall be furnished by the filter manufacturer.

### 2.4.2 Filter Media

The filtering media shall be of continuously bonded fiberglass material having a nominal thickness of 2-inches, which when clean shall not compress more than 1/2-inch when subjected to air at 500 feet per minute velocity. Each roll shall contain not less than 65 running feet of filter media. The media, when tested in accordance with National Bureau of Standards type dynamic test at a rated velocity of 500 feet per minute, shall have an average efficiency of not less than 75% and shall have received not less 200-grams of dust per square foot of media. The operation and maintenance requirements of this filter shall be such as not to require water or sewer connections, or any type of adhesive reservoir.

### 2.4.3 Operation

- A. The roll of clean media shall be installed at top of filter casing, and the filtering material shall be automatically fed down the face of the filter and rerolled on a disposable spool at the bottom after it has accumulated its dirt load. A device shall be provided to insure compact rewinding of the dirt loaded media.
- B. The frequency with which the filter media moves and the distance it travels shall be controlled by an automatic timer, interlocked with the fan motor starter, which shall move the filter media intermittently and shall maintain a substantially constant operating resistance. The media shall move only when the fan is in operation. The timer control shall be capable of full range field adjustment of media feed rate but shall be initially set so that the operating resistance under normal conditions is 0.45 inches w.g.. Each filter section shall be provided with a runout switch, which shall be wired to the control panel. When the supply of clean media has been exhausted, the filter drive motor shall stop and the signal light shall be energized. Filter shall also be provided with a media overload pressure switch, so connected as to by-pass the timer and advance the media during periods when unusually heavy dust loads occur.
- C. Provide and install an air filter gauge for measuring the resistance to air flow through the filters, one for each complete filter unit. The gauge shall be of the inclined tube differential type, of solid acrylic plastic construction with built-in level vial, equipped with two 3-way angle type valves for venting to atmosphere, and shall have an adjustable scale of metal with clearly legible, engraved figures and graduations. The gauge shall be furnished with aluminum tubing, two static pressure tips, two toggle bolt mount assemblies, all necessary fittings, and additional bottle of red gauge oil, and complete instructions. Gauge shall be Catalog No. 250-AF, reading



## 15000 - Mechanical

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to 1.0-inch water, in .02-inch divisions, as manufactured by the F.W. Dwyer Manufacturing Company, or other approved equal.

### 2.4.4 Spare Filter Rolls

In addition to the roll of filter media required for the initial operating of each filter unit, two (2) additional rolls of media for each filter unit shall be furnished by this Contractor for use as spares. Filter media shall be the same make and type as regularly furnished by the unit manufacturer.

### 2.4.5 Approved Makes

Automatic air filters shall be American Air Filter Co.'s Roll-O-Matic Model J, Cambridge Filter Corp.'s Auto-Roll, Continental Air Filters Co.'s Conomatic Type VA, or other approved equal conforming to the requirements noted herein. submit complete shop drawings, etc., for approval.

2.5 Permanent Washable Panel Filters shall consist of galvanized steel media and frames, 1-inch or 2-inch thickness as required. Filters shall have an initial resistance not greater than 0.10 inch w.g. at 500 fpm face velocity.

2.6 HEPA Filters shall be constructed of UL-listed Class 1 glass fiber media sealed in a rigid casing. Filters shall be rated by the DOP Test Method on 0.3 micron particles. Filter initial resistance shall not be greater than 1.0 inch w.g. for the rated airflow. Filters shall be furnished complete with necessary gaskets.

2.6.1 Filter Rated for 150 fpm Face Velocity with 95 percent DOP - efficiency; 6-inch filter depth.

2.6.2 Filter Rated for 250 fpm Face Velocity with 95 percent DOP efficiency; 12-inch filter depth.

2.6.3 Filter Rated for 150 fpm Face Velocity with 99.99 percent DOP efficiency; 6-inch filter depth.

2.6.4 Filter Rated for 250 fpm Face Velocity with 99.99 percent DOP efficiency; 12-inch filter depth.

2.7 Activated Carbon Filters shall be constructed of epoxy-coated perforated steel trays containing the activated carbon. Individual trays shall mount in a gasketed side access housing. The unit shall have an initial resistance of 0.35 inch w.g. at 500 fpm face velocity.

2.8 Electronic Aircleaners shall consist of an electrostatic agglomerator section and a renewable fibrous glass collector. The unit shall provide a dustspot efficiency of 90 percent at 500 fpm face velocity. Typical operating resistance shall be 0.40 inch w.g.

2.9 Dust Collectors shall be the dry centrifugal type complete with integral blower, dust separator, and hopper,

### 3.0 EXECUTION:

Install filters in accordance with applicable sections of NFPA 70, 90A, and 90B.

END OF SECTION 15880



## SECTION 15890

### SOUND ATTENUATORS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of sound attenuators. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS: Sound attenuators shall be constructed of galvanized steel with acoustical baffle as required to provide the desired attenuation. Methods for presenting sound attenuation data shall be consistent with the ASHRAE Handbook Series.
- 2.1 Construction:
- Outer casings of the sound traps shall be fabricated from No. 22-gauge, or heavier, galvanized sheet steel. Interior air passages shall be manufactured from No. 24-gauge, or heavier, galvanized sheet steel having 3/32-inch holes on 3/16-inch staggered centers. All parts shall be stiffened to eliminate audible vibration while being sufficiently pliant to absorb air vibrations. The spaces between the air passages shall be packed with inert, vermin-proof and sound absorbent acoustical material.
- 2.2 Performance:
- The attenuation values obtained by the sound traps shall be not less than those tabulated on the drawing. They shall be true attenuation values, and shall include only the true attenuation accomplished by the sound traps. These true attenuations shall not include any effects due to (1) end reflections, (2) room absorptions, (3) plenum absorption, (4) directivity, (5) beaming, (6) standing waves or (7) distance factors. The traps shall be tested by either the Insertion Loss Method or the End Difference Method to establish their ratings.
- 2.3 Air Flow Pressure Drop:
- Air flow pressure drop values shall not exceed those indicated on the drawings. The air flow pressure drop performance shall be certified by the manufacturer to have been tested and rated in accordance with applicable portions of AMCA Bulletin 210, or with a method of air measurement approved by the Contracting Officer.
- 2.4 Approved Makes:
- Sound traps shall be as manufactured by Industrial Acoustics Co., Inc., Koppers Co., Inc., Korfund Dynamics Corp., Silence, Inc., or other approved equal that conforms to the characteristics as outlined above and as tabulated on the drawings. Submit complete shop drawings for approval.
- 3.0 EXECUTION: Installation shall comply with the SMACNA duct construction standards.
- END OF SECTION 15890



## SECTION 15900a

### CONTROL DEVICES FOR MECHANICAL EQUIPMENT

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of control devices for mechanical equipment. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.0.1 General Requirements:
- A. Scope: Furnish and install, complete and in satisfactory operating condition, a two pipe system of temperature controls, etc., as shown on the drawings and as specified. Control system shall be of the pneumatic room type and shall include the louver dampers and damper controls for the fan systems, louver dampers for oil burner fresh air intakes, indoor and outdoor thermostats, control cabinets, etc., all as required to make a complete control system.
  - B. Shop Drawings: Submit complete shop drawings for each temperature regulating system and for each item of equipment furnished as part of the temperature regulating systems.
  - C. Installation: The installation of the temperature control system shall be made by the manufacturer of the equipment.
- 2.1 Controls may include sensors, transducers, controllers, controlled devices, and other accessories as required. Typical items include thermostats, humidistats, aquastats, controllers, control valves, dampers, specialized control packages, air supply packages, tubing, control wiring, and panels. Where a complete control system is replaced, all new control components shall be by the same manufacturer.
- 3.0 EXECUTION:
- 3.1 All Control Components other than those located in finished spaces shall be clearly tagged.
- 3.2 Control Valves shall be mounted horizontally with operator up unless otherwise directed by the Contracting Officer.
- 3.3 Instrument Air for pneumatic controls shall be clean, dry, oil-free compressed air.
- 4.0 TESTS:
- 4.1 Pressure Test: All air lines, air line valves, etc., shall be subjected to oil of peppermint and air test of 30 psi and the lines shall be made tight at such pressure. This test shall be made in the presence of the Contracting Officer or his designated representative, and the Contractor shall notify the Contracting Officer in writing at least three days prior to such test. This test is applicable to new and altered work.
- 4.2 Operational Test of Equipment:



- A. Upon completion of the compressed air piping system, a pressure of 30 psi shall be placed on the system and maintained for a period of 24-hours. After that time, a loss of not more than 5-pounds pressure will be allowed. Thermostats and pneumatic operators shall be excluded from the test. This test is applicable to new and altered work.
- B. The Contractor shall test all tubing, thermostats, pneumatic valves, and damper operators to insure that adequate air pressure is available for proper operation. Correct functioning of damper operation shall be demonstrated. With steam on, the Contractor shall turn all room thermostats down to their lowest setting and it shall be shown that the steam supply to the convectors and to the air heating coils has been shut off. The thermostats shall then be adjusted to their highest setting, and the convectors and air heating coils shall be rechecked to determine if the steam supply has been resumed. Thermostats controlling cooling equipment shall also be tested in an equivalent manner. All inoperative tubing, thermostats, pneumatic valves, and damper operators shall be repaired or replaced. During these tests, the Contractor shall instruct the Contracting Officer's staff in the operation and maintenance of the entire temperature control system. Allow sufficient time for instructions.
- C. The calibration of all room thermostats which control direct radiation shall be checked at a time when the outdoor temperature is below 50 F. The set point of each thermostat shall be increased approximately 5 degrees, and the room temperature shall equal the new thermostat setting, when measured by a test thermometer on the following day. Thermostats failing this test shall be recalibrated. At the conclusion of the testing, the specified set point for each thermostat shall be re-established.
- D. Testing and instructions shall be done in the presence of the Contracting Officer's staff.

4.3 Guarantee and Inspection:

- A. In addition to the terms of the guarantee the Contractor shall guarantee the new and altered temperature control system for a total period of three years from the date of substantial completion of the heating and ventilating work. ("Substantial completion" shall be as defined in the Contract.) The guarantee shall include the repairs and adjustments to all components of the temperature control system. Repairs and adjustments shall be performed by mechanics employed by the temperature control manufacturer. The guarantee shall also include and annual inspection and servicing of the temperature control system, to be performed with a two-month period prior to the start of the heating season. The inspection and servicing shall be witnessed by the Contracting Officer.
- B. The Contractor shall submit with his application for payment at time of substantial completion, three copies of the guarantee and operating sequences, drawings or instructions issued by the temperature control manufacturer.

4.4 Approved Makes: Temperature control systems manufactured by Honeywell Inc., Johnson Controls Inc., MCC Powers Barber-Colman or Robertshaw Controls Co. conforming to the requirements of the drawings, specifications and job conditions will be approved.

4.5 Each building shall be provided with the required control system and "points" as specified by the Contracting Officer.

END OF SECTION 15900a





## SECTION 15900b

### ENERGY MANAGEMENT

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of energy management systems. Installation procedures shall be in accordance with product manufacturer's recommendations.
- 2.0 PRODUCTS:
- 2.1 HVAC SYSTEM CONTROLS
  - 2.1.1 The designer shall designate, specify, or otherwise show in the construction documents the type of controls and control systems needed. This shall include a description or sequence of control of the system's operational procedures.
  - 2.1.2 Controls may be electric, pneumatic, electronic, or direct digital. Control action may be "on/off", or proportional that can use manual, automatic, or remote reset and can have rate of action or derivative action compensation as designated by the designer. The designer shall designate accuracy and long term requirements for controls.
  - 2.1.3 All primary energy conversion equipment such as boilers, heat exchangers, refrigeration units, furnaces and heat pumps shall have a load activated local control loop for each piece of equipment. Controls for multiple equipment shall integrate the individual control units or provide system control for all the units.
  - 2.1.4 All energy delivery systems shall have a local control loop for each system.
  - 2.1.5 Energy consuming systems or components with a peak use greater than 1kW or 3,500 Btu/h shall be provided with a means of shut-off when occupancy or weather conditions do not require its operation.
  - 2.1.6 The control equipment provided for local control loops except for "on/off" and self-contained sensor devices shall be arranged so that sensing, control action, and control setting variables can be read or tested at the device.
  - 2.1.7 Control loops for terminal unit zones with less than 24 hours per day or 7 days per week occupancy shall have separate control points for day and night heating and cooling. The devices shall be capable of local resetting, and have provisions for remote management system selection of the occupied or unoccupied heating or cooling mode of operation.
- 2.2 CENTRAL MONITORING AND CONTROL SYSTEMS
  - 2.2.1 The minimum energy management requirements for a central monitoring and control system shall be to:
    - A. Read and retain daily totals for all energy measurement instruments;
    - B. Total all energy values weekly and record and retain values placed on a summary report;





- C. Record and plot hourly outdoor and indoor temperatures against real time and summarize and report for each year in a format compatible with degree-days or bin temperature;
- D. Based on time schedules, turn on or off any HVAC or service water heating system or equipment;
- E. Based on time schedules, turn on or off major building lighting and occupancy power circuits;
- F. Reset local loop control systems for HVAC equipment;
- G. Monitor and verify operation of heating, cooling and energy delivery systems;
- H. Monitor and verify operation of lighting and occupant power, auxiliary and service hot water systems;
- I. Provide readily accessible override controls so that time-based HVAC and lighting controls may be temporarily overridden during off hours; and
- J. Provide optimum start/stop for HVAC systems.

### 2.3 COMPLETION REQUIREMENTS

- 2.3.1 The building construction documents shall describe the requirements for placing all energy management systems in operation. This includes check-out procedures and all controls and metering equipment operational information.
- 2.3.2 The building construction documents shall describe the requirements for balancing and check-out procedures for all HVAC systems and equipment. All HVAC system balancing shall be required to be accomplished in a manner to minimize throttling losses. In air systems, fan speeds shall be required to be adjusted to meet design conditions. Water systems shall be required to be proportionally adjusted to minimize throttling losses and then corrected to design flow conditions by trimming the pump impeller or changing pump speed. The design specifications shall state that a pump shall not be brought to final flow conditions by valving..
- 2.3.3 The building construction documents shall describe the requirements for control system testing to assure that control elements are calibrated, ranges adjusted, set points ascertained, and full travel of moveable elements assured. All elements in the control system shall be tested with the system in operation.

### 2.4 ENERGY PERFORMANCE TESTING

- 2.4.1 The building construction documents shall describe the requirements for determining building energy performance in the completed, operational building.
- 2.4.2 The building energy performance testing shall be performed in winter for heating and in summer for cooling. These tests shall ascertain the in-site capabilities of all HVAC systems and equipment. Internal building loads shall be accounted for in assessing cooling performance. Heating performance shall be determined during unoccupied night time periods during winter weather. If any internal load, such as lighting, contributes to building heating, such loads shall be accounted for in assessing heating performance.
- 2.4.3 Energy use measurements shall be made for the overall building system while HVAC system performance is being tested. Each energy management and control system shall be used to determine energy use for:



## 15000 - Mechanical

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- A. Utility energy;
- B. Commercial service energy;
- C. Occupant lighting and receptacle power;
- D. Production process energy;
- E. Auxiliary systems and service water heating energy;
- F. Space heating energy;
- G. Space cooling energy; and
- H. HVAC delivery system energy.

2.4.4 Test periods shall be at least six (6) hours in duration. Hourly outdoor and indoor temperatures, solar intensity during a day test, and wind speed during a night test shall be recorded.

2.4.5 The building energy performance test data shall, at minimum, measure energy use and outdoor temperatures hourly for each test period.

2.4.6 As-built information shall be provided for all the following energy-related features of the building:

2.4.6.1 Thermal and solar/optical transmission characteristics of the building envelope, including infiltration;

2.4.6.2 The operating characteristics of the HVAC, lighting, and service water heating equipment and systems.

### 3.0 EXECUTION

3.1 Upon completion of the work the building operator shall be provided with the following:

- A. As-built drawings and specifications;
- B. Operating manuals with a schematic diagram, sequence of operation and system operating criteria for each and all systems installed;
- C. Where the building systems are complex, a comprehensive balancing and testing program and report to demonstrate the energy performance capabilities of the system; and
- D. Maintenance manuals with complete information for all major components in the facility.

END OF SECTION 15900b



## SECTION 15915

### COMPRESSED AIR EQUIPMENT

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of compressed air equipment. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
  - 2.1 All New Compressed Air Equipment and materials for repair or replacement shall comply with ANSI Safety Standard B19.3, and ASME Boiler and Pressure Vessel Code, Section VIII.
  - 2.2 New Reciprocating Air Compressors shall be of the two-stage, heavy-duty, double-acting, water-cooled, "Y" or "L" cylinder type complete with flange-mounted drive motor. The piston, valve, and cylinder construction shall not require lubrication. Teflon piston rings - and Teflon or carbon rider rings shall be used.
    - 2.2.1 Bearings: Main crankshaft bearings shall be anti-friction roller or ball type. Connecting rod bearings shall be sleeve type,
    - 2.2.2 Valves: Compressor cylinder valves shall be of the channel, feather, or plate type suitable for service without external lubrication.
    - 2.2.3 Lubrication: Force-feed lubrication system shall lubricate the crankshaft, connecting rod, and crosshead bearings.
    - 2.2.4 Rod Packing: Piston rod packing shall be Teflon or carbon non-lubricating type.
    - 2.2.5 Intake Air Filter - Silencer shall be a pipe-supported dry type capable of removing 95 percent of all particles 10 microns and larger.
    - 2.2.6 Intercooler and Aftercooler shall be a shell-and-tube or plate type.
    - 2.2.7 Motor shall be squirrel-cage induction, drip-proof, NEMA Class B, with split-sleeve bearings.
  - 2.3 New Centrifugal and Rotary Screw Compressors shall be of the multi-stage or two-stage type driven by an electric motor through speed-increaser gears.
    - 2.3.1 Intake Air Filter-Silencer shall be a full-capacity dry type capable of removing 95 percent of all particles 10 microns and larger.
    - 2.3.2 Blow-off Silencer shall be a full-capacity blow-off vent type.
    - 2.3.3 Bearings: Centrifugal compressor radial bearings shall be of the pivoted shoe type. Axial bearings shall be Kingsbury-type thrust bearings capable of absorbing thrust in either direction. Rotary screw compressor radial bearings shall be anti-friction roller type. Ball thrust bearings shall be provided to carry the axial load.



## 15000 - Mechanical

- 2.3.4 Seals: Centrifugal compressors shall be labyrinth or carbon ring-type air and oil seals. Rotary screw compressors shall be stainless steel sealing rings.
- 2.3.5 Intercoolers and Aftercoolers shall be water-cooled shell and tube type.
- 2.3.6 Vents and Drains: Vents shall be tapped and plugged. Drains shall be complete with drain valves.
- 2.3.7 Lubricating Oil System shall be a shaft-driven main oil pump, motor-driven AUXILIARY oil pump, dual oil coolers, oil reservoir, dual oil filters, pressure switches and gauges, check valves, valves, and interconnecting piping.
- 2.3.8 Check Valves shall be 150-pound class, carbon steel.
- 2.4 New Control Air Compressor and Dryer shall be air-cooled with a reciprocating compressor and a single receiver constructed in accordance with ASAE Code requirements. "Motor shall be NEMA Class B design with built-in overload protection. Unit shall include an air gauge, pop safety valve, external check valve, filter, pressure switch, and drain cock. Air dryer shall be refrigerated type designed for continuous operation with hermetically sealed compressor, heat exchanger, ambient air filter, and automatic drain trap. Oil and water filter shall have aluminum housing with pressure rating of 250 psig at 70 F and include manual drain valve and 10 replacement filters.
- 2.5 Aftercoolers shall be of the watercooled, shell-and-tube pipeline type with adequate surface area to limit the discharge to the temperature required. The unit shall include moisture separators, gauge glasses, automatic condensation traps, valves, drain piping, and thermal relief's on the water side.
- 2.6 Receivers shall meet ASME Code requirements and shall include pressure gauge, relief valve, shutoff valve,, automatic moisture trap, and drain valve.
- 2.7 All Rotating Parts and Equipment shall be true, dynamically balanced at the factory, and shall include vibration isolators.
- 2.8 Safety Guards shall meet OSHA requirements.
- 2.9 Air compressors shall be manufactured by Brunner Manufacturing Co., Curtis Pneumatec Machinery Co., Gardner-Denver Co., or Quincy Compressor Division of Colt Industries, or approved equal.
- 3.0 EXECUTION:
- 3.1 Repair and Replacement Work done on receiver tanks .shall be in accordance with ASME Pressure Vessel Code and the NBBI. Repair procedures shall provide structural integrity as required by NBBI-23.
- 3.2 Welding shall be performed in compliance with AWS D 1.1 and ASME Code Section IX.
- 3.3 Repaired Pressure Parts and Replacement Pressure Parts shall be tested after completion of repair or installation in accordance with the ASME Code.
- 3.4 Submit complete shop drawings of compressors, motors, drive, tank, starters, alternator, pressure switches, control cabinet, etc. for approval.

END OF SECTION 15915



## SECTION 15937

### CONTROL AND FIRE DAMPERS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of control, fire, and multiblade dampers. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
- 2.1 New Control Dampers may be of parallel or opposed blade design and shall be tested in accordance with the requirements of AMCA 500 for the specific performance characteristics required. Construction shall be in accordance with the requirements of SMACNA construction standards, as well as ASIQUE recommendations pertaining to construction of duct accessories.
- 2.2 Fire Dampers:
- Furnish and install galvanized steel fire dampers in the ductwork in the locations indicated on the drawings. They shall be installed in accordance with the details shown on the drawings. Fusible links shall operate at approximately 160° F. Each fire damper shall be approved by the Corpus Christi Army Depot and appeals and shall bear a label indicating this approval, as well as the pertinent B.S.&A. Calendar number. Fire dampers shall be Advanced Air Inc. Series 75, Air Balance Inc. "Fire Seal", Imperial Damper Co. No. VWNYT-1, Ruskin Mfg. Co. Model IBD, or other approval equal. Submit shop drawings for approval.
- 2.3 Multiblade Dampers:
- A. Multiblade dampers shown on the drawings in connection with outside air intake, exhaust air discharge, and air recirculation of the fan system, as well as the boiler room outside air intake for the oil burners, shall be the product of the manufacturer of the temperature control equipment. Boiler room outside air intake dampers shall be divided into units corresponding with the number of oil burners, as indicated on the drawings.
- B. Self-acting dampers used in the inlet to roof type exhaust fans shall be provided by the fan manufacturers.
- C. Provide louvers and screens in wall openings as shown on the drawings.
- 3.0 EXECUTION:
- 3.1 Control Damper Installation and Repair Work shall be in compliance with applicable portions of details of construction, as shown in ASHRAE and SMACNA standards.
- 3.2 Fire Damper Installation and Repair Work for dampers in air conditioning and ventilating duct openings, through walls and floors, shall be in compliance with the requirements of NFPA Standard 90A and the SMACNA Fire Damper and Heat Stop Guide for Air Handling Systems. Fire damper installation and repair work for dampers in wall openings without ducts shall be repaired or replaced in compliance with the requirements of NFPA 80, when such openings are not passageways.



## 15000 - Mechanical

### 3.3 Multiblade Damper Installations:

- A. Multiblade damper frames shall be of steel: 1/8-inch thick channel shape or 1/4-inch thick flat bar. They shall be braced for rigid reinforcement. Frames shall be provided with bolt holes for mounting and with stationary stops on the four sides to prevent air leakage. Boiler room outside air intake damper frames shall be provided in a lower corner, so that motor mounting bracket can be securely bolted to frame.
- B. Multiblade damper blades shall be not wider than 10-inches, shall have formed interlocking edges, and shall have a 1/2-inch deep "V" pressed in the center to stiffen the blades. Blade axles, axle clamps and blade connecting lugs shall be of non-ferrous metal. Blades shall be linked firmly together so that all blades work in unison. The lower blade shall be provided with a linkage connection lug for motor operation of the damper. Open position of the blades shall be limited to 90°F. Damper blades for fan systems shall be not lighter than No. 16-gauge galvanized sheet steel. Unless shown otherwise on the drawing, damper blades for supply systems shall be of the opposed blade type, and those for exhaust systems and boiler room outside air intake shall be parallel type. Damper blades for Boiler Room outside air intake shall be not lighter than No. 14-gauge aluminum.
- C. Bearings on blade pivot points shall be fitted with stainless steel or non-ferrous metal sleeve (or ferrule type) pressed into damper frame. Bearings shall be accurately sized to fit blade axles, and shall provide smooth operation.
- D. Linkage or tie rod to interconnect blades shall be of non-ferrous metal and shall be second to the blade lugs by means of cotter pins and washers.

### 3.4 Painting:

Damper frames shall be given one coat of black asphalt paint over a prime coat of red oxide or zinc chromate. Galvanized steel damper blades shall be primed with galvanized iron primer and given one coat of black asphaltum paint. Painting shall be done at the shop.

### 3.5 Control for Multiblade Dampers:

Boiler Room outside air dampers shall be automatically operated by means of electric damper motors. Multiblade dampers in ductwork shall be controlled as indicated on the drawings and as follows:

- 1. Automatically (Air) Operated Dampers (A.A.D.). Each multiple damper indicated on the drawings as "A.A.D." shall be operated by means of an air motor and an electric solenoid air valve. Furnish and install in the air line to each air motor in a place convenient for operation, a direct-acting (air in main when energized) solenoid air valve and a three-way air valve or the approved combination of the two devices. The operation shall be such that when the fan motor is started, the damper will open; when the fan motor is stopped, the damper will close. It shall also be possible to by-pass the solenoid valve, by means of the three-way air valve, and to operate the damper manually. Solenoid air valves shall be installed near the corresponding fan motor starters. Electric wiring connections between the solenoids and the motor starters will be made by the Contractor .
- 2. Manually (Air) Operated Dampers (M.A.D.). Each multiblade damper indicated on the drawings as "M.A.D." shall be manually operated by means of an air motor and a three-way air valve. The valve shall be installed in the air line to the air motor in a place convenient for operation.



## 15000 - Mechanical

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3. Manually Operated Dampers (M.L.D). Each multiblade damper indicated on the drawings as "M.L.D." shall be manually operated by means of chains, levers, or other manual devices as indicated.

END OF SECTION 15937

END OF SPECIFICATION SECTION 15 - Mechanical



## 15000 - Mechanical

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## SECTION 16050

### WIRING SYSTEMS EQUIPMENT

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials to include repair and maintenance of wiring systems equipment. Products shall be as approved by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
  - 2.1 Copper Wire: ASTM B 3, ASTM B 8.
  - 2.2 Aluminum Wire: ASTM B 230, ASTM B 231
  - 2.3 Busways and Fittings: UL 857, NEMA BU 1
  - 2.4 Plugs and Receptacles: UL 498, NEMA WD 1 and NEMA WD 6
  - 2.5 Conduit: ANSI C80.1, C80.3, and C80.5 and NEMA RN 1.
  - 2.6 Enclosures: NEMA ICS 6 and OS 1.
  - 2.7 Specific Purpose Wiring Devices: NEMA WD 1, NEMA WD 6.
  - 2.8 General Electrical: NFPA 70 and 70B.
  - 2.9 Flexible Metal Conduit: UL 1.
  - 2.10 Surface Metal Raceways and Fittings: UL 5
  - 2.11 Liquid-Tight Flexible Steel Conduit: UL 360.
- 3.0 EXECUTION:
  - 3.1 Coordination: Contractor shall determine that the wiring system has been de-energized. Before de-energization, the Contractor shall ensure that equipment served by the wiring system will not be damaged by the power outage.
  - 3.2 Clearances: Working clearances shall comply with NFPA 70.

END OF SECTION 16050



## 16000 - Electrical

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### SECTION 16120

#### WIRE, CABLE AND WIRING (600 VOLT MAXIMUM)

##### PART I - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and Conditions of the Contract, including the General Conditions and Supplementary Conditions apply to the work of this Section.

##### 1.2 DESCRIPTION OF WORK

- A. This Section includes building wires and cables and associated splices, connectors, and terminations for wiring systems rated 600 volt maximum.
- B. Conductor Coding:
  - 1. Color code insulated grounding conductors in accordance with NEC 210-5(B).
  - 2. Color code current carrying conductors (except control and instrumentation conductors) as follows:
    - a. 120/208 Volt System

Phase A	Black
Phase B	Red
Phase C	Blue
Neutral	White
Ground	Green
    - b. Provide continuous insulation color for No. 14 through No. 6 conductors.
    - c. Color code conductors larger than No. 6 which do not have continuous insulation color by application of at least two laps or colored tape on each conductor at all points of access including junction boxes.

##### 1.3 QUALITY ASSURANCE

- A. Manufacturers: Firms regularly engaged in manufacturer of electrical wires and cables products of types required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Installer: A firm with not less than 5 years of successful experience in installation of raceways similar to those required for this project.

##### 1.4 DELIVERY, STORAGE AND HANDLING

- A. Deliver wire and cable according to NEMA WC-26.



## Part 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Wire and cable shall be manufactured by Anaconda, Okonite, Triangle or approved equal.
- B. Wire and cable shall meet the standard Specifications and tests established for such materials and construction by ASTM, NEMA, UL, ANSI, and IPCEA, where applicable.
- C. Material construction data, insulation thickness, jacket thickness, test data, and sample shall be submitted for approval upon request.
- D. Wire for general use, sizes No. 12 AWG to 500 KCM inclusive, shall be single conductor, stranded annealed copper, 600 volt thermoplastic insulation, covered with nylon jacket, suitable for use in wet or dry locations at temperatures not exceeding 90 degree C, N EC Type THHN or approved equal; except that wire #10AWG and smaller may be solid.
- E. Minimum size No. 12 AWG for power wiring and minimum size No. 14 WG for control wiring.
- F. The use of aluminum conductors will not be permitted.
- G. Wire and cable shall be suitably protected from weather and damage during storage and handling and shall be in first-class condition when installed.

### 2.2 WIRE AND CABLE INSTALLATION

- A. General: Except as noted on the drawings or in these Specifications, all wire and cable for power and control wiring shall be single conductor copper, labeled by Underwriters' Laboratory and shall conform to applicable sections of the NEC.
- B. As far as practicable, all feeder cables shall be continuous from origin to panel termination without running splices in intermediate pull boxes or splicing chambers. Sufficient slack shall be left at the terminations to make proper connections.
- C. Lubricants, if required for pulling wire and cable, shall be as recommended by the manufacturer of the wire or cable.
- D. Lubricant shall be further restricted to exclude any substance which permanently clings to the cable or tends to fill the raceway and hinder the extraction and reinsertion of cable.
- E. All cable terminals, taps and splices shall be made using with copper or copper alloy solderless pressure type connectors, unless otherwise specified. Connectors shall be large enough to enclose all conductor strands. Connection shall be taped with No. 33 Scotch electrical tape.
- F. All control wires shall be terminated with Thomas & Betts "Stak-On" pressure connectors, or approved equal.
- G. All splicing where necessary and required, shall be done in outlet boxes, junction boxes, or other boxes approved fittings and not in the conduit.
- H. All connections at motors shall be with "Stack-on" pressure connectors and "Ever-dur" machine bolts, washers, lock washers, nuts and taped with Scotch No. 33 tape.
- I. Conductors up to and including No. 8 to be pigtail spliced shall be spliced with a Scotchlock Type "B" or "R" connector or ideal two piece connector having a metallic crimp type connector



## 16000 - Electrical

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with a plastic insulating cover. Insulating covers shall have a temperature rating of 105 degree C., and approved for 600 volts.

- J. Wire labels for circuit identification of wire and cable shall be Brandy Heat Shrink Sleeves or approved equal, applied at both ends of conductor.
- K. In certain systems, equipment furnished by an approved manufacturer may require a different number and arrangement of conductors from that indicated on the drawings. In such cases, the electrical Contractor shall comply with such requirements at no additional cost to the Corpus Christi Army Depot.
- L. In the event the electrical Contractor chooses to furnish and install a system or item of equipment of different arrangement from that shown or specified, he shall furnish and install any additional wiring and conduit required by that system at no additional cost to the Corpus Christi Army Depot.

END OF SECTION 16120



## SECTION 16131

### PULL AND JUNCTION BOXES

#### PART I - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and Conditions of the Contract, including the General Conditions and Supplementary Conditions apply to the work this Section.

##### 1.2 DESCRIPTION OF WORK

- A. Provide pull and junction boxes where indicated on the drawings, where required for changes in direction and where required by the National Electrical Code.

#### PART 2 - PRODUCTS

##### 2.1 MATERIALS

- A. General: The Contractor shall furnish and install junction and pull boxes wherever indicated on the drawings, and at such other locations as may be required to avoid obstructions or to facilitate the installation of wire and cable.
- B. All boxes shall be hot dipped galvanized, Code gauge or 16 gauge minimum thickness and sufficient size to meet all Code requirements and minimum bending radius of cables. No box shall be drilled for more conduits than actually enter it, and all boxes shall be accessible.
- C. Boxes shall be supported independent of all conduit and shall be rigidly secured in place. Box supports shall conform to the general requirements for conduit supports. Small cast metal boxes threaded to conduits need not be separately supported except where boxes are used as fixture support.
- D. Conduit boxes, outlet, switch, junction, and pull boxes, extension rings, adapters, and cover plates shall be sheradized, galvanized, or cadmium plated. Boxes for exposed work shall be cast or **malleable** iron with neoprene gasket cover plate.
- E. Special junction and pull boxes shall be of the type and minimum dimensions indicated on the drawings.
- F. Rigid Steel Conduit, Elbows and Couplings shall conform to the type and minimum dimensions indicated on the drawings.
- G. Where Electrical Metallic tubing is installed, the connectors and coupling shall be the "T & B" rain tight, steel compression type. The connectors and couplings shall be the nylon insulated throat type as manufactured by the Thomas and Betts Co. series 5123, series 5120 respectively. Zinc die cast fittings are not permitted.
- H. Fittings for Rigid Steel Conduit shall be cast or malleable iron bodies, cadmium or zinc-plated with taper threads and tapped holes for screw attached cover of an appropriate material.



## 16000 - Electrical

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Fittings shall be of a type providing maximum wiring space, and shall be Appleton Form 35, or Crouse-Hinds Form 7, or approved equal. Covers shall be neoprene gasketed.

- I. Locknuts for Rigid Steel Conduit shall be cast or malleable iron or steel' zinc or cadmium plated.
- J. Bushings for Rigid Steel Conduit shall be made of malleable iron or steel and shall have an insulating insert of thermosetting plastic molded to a locking surface on the bushing ring. Grounding bushings O.Z. Type "IG13", or equal shall be used.
- K. Liquid-Tight, Flexible Steel Conduit shall be flexible steel with a PVC jacket and shall be "Sealtite" or approved equal, Type "UA" for 3/4" to 1/4" sizes inclusive, and Type "UP" for 1-1/2" size and larger.
- L. Liquid-Tight, Flexible Steel Conduit Fittings shall be designed to maintain the liquid~tight feature of the installation, and shall be Crouse-Hinds "LT" series, or. Approved equal.

PART 3 - EXECUTION (Not Applicable).

END OF SECTION 16131



## SECTION 16160

### PANELBOARDS

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and Conditions of the Contract, including the General Conditions and Supplementary Conditions apply to the work of this Section.

##### 1.2 DESCRIPTION OF WORK

- A. Provide panelboards with ratings and features as herein specified.
- B. Panelboards interiors shall comply with ratings and standard as herein specified.

#### PART 2 -PRODUCTS

##### 2.1 MATERIALS

- A. General: Panelboards shall be of dead front construction, incorporating switching and protective devices of the number, rating and type noted herein, and as shown on the drawings.
- B. Panelboards shall have NEMA I enclosure and shall be mounted as noted on the drawings.
- C. Panelboards shall be rated for the intended voltage and shall meet all the applicable standards of NEMA, IEEE, NEC, and Federal Specification II5a.
- D. Panelboards shall be UL listed as a complete assembly.
- E. A nameplate shall be provided listing panel type and ratings.
- F. Panelboard ratings shall be established by heat rise tests with maximum hot spot temperature on any connector or bus bar not to exceed 50 degree C. rise above ambient. Heat rise tests shall be conducted in accordance with UL standards.

##### 2.2 INTERIORS

- A. All interiors shall be completely factory assembled.
- B. Wire connectors, except screw terminals, shall be of the anti-turn solderless type and shall be suitable for copper or aluminum wire of the sizes shown on the drawings.
- C. Interiors shall be designed so that switching and protective devices can be replaced without disturbing adjacent units and without removing the main bus connectors and shall be designed that circuits may be changed without machining, drilling, or tapping.
- D. Branch circuits shall be arranged using double row construction as far as practicable.
- E. Busbars shall be copper. Aluminum will not be accepted.



## 16000 - Electrical

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- F. Full size ground bus shall be provided with suitable lugs for each outgoing feeder requiring a neutral connection.
- G. Full size ground bus shall be provided with suitable lugs for each outgoing feed and supply connection.
- H. The short circuit rating of the panelboard shall be a minimum 22,000 RMS symmetrical amperes at 240 volts AC or as indicated on the plans, regardless of the rating of branch circuit devices.
- I. Panelboards shall be marked with their maximum short circuit current rating at the supply voltage.
- J. Phase bussing shall be full height without reduction. Cross and center connectors shall be copper.
- K. Bus bar taps for panels with single pole branches shall be arranged for sequence phasing of the branch circuit devices.
- L. Spaces for future switching and protective devices on lighting and appliance panelboards shall be bussed for the maximum device that can be fitted into them.

### 2.3 BOXES

- A. Boxes shall be confirm to NEMA 1.
- B. Boxes shall be of sufficient size to provide minimum gutter space on all sides, as required by the NEC.
- C. Where feeder cables supplying the mains of a panel are carried through its box to supply other electrical equipment, the box shall be sized to include this wiring space. This wiring space shall be in addition to the minimum gutter space required by the NEC.
- D. At least four (4) interior mounting studs shall be provided.
- E. Panel Box Shall Use Three piece construction: Wrapper sheet for back and two sides with removable top and bottom ends.

### 2.4 CIRCUIT BREAKERS

- A. Circuit breakers shall be equipped with individually insulated, braced and protected connectors.
- B. The front faces of all circuit breakers shall be flush with each other. Large, permanent, individual circuit numbers shall be affixed to each breaker in a uniform position.
- C. Provisions for additional breakers shall be such that no additional connectors will be required to add branch circuit breakers.
- D. The minimum UL listed interrupting rating for the main circuit breaker shall be 22,000 RMS symmetrical amperes at 240 volts AC or as indicated on the plans.
- E. Circuit breakers shall be one, two or three pole thermal magnetic molded case circuit breakers, ratings as specified on the drawings.
- F. All circuit breakers shall be UL listed and meet applicable NEMA, IEEE and Federal Specifications.





## 16000 - Electrical

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- G. Breakers shall have over center toggle-type mechanisms, providing quick-make, quick-break action, calibrated for operation in an ambient temperature of 40 degree C.
- H. Breakers shall have trip indication by handle position and shall be trip-free. Two and three pole breakers shall be common trip.
- 1. Circuit breakers shall have removable lugs. Lugs shall be UL listed for copper and aluminum conductors of sizes as noted on the drawings.

### 2.5 MANUFACTURER

- A. Products shall be of Square D Company and Westinghouse or approved equal.

END OF SECTION 16160



## 16000 - Electrical

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### SECTION 16175 SAFETY SWITCHES

#### PART 1 - GENERAL

##### RELATED DOCUMENTS

- A. Drawings and Conditions of the Contract, including General Conditions and Supplementary Conditions apply to the work of this Section.

##### 1.2 QUALITY ASSURANCE

- A. Standards: NEMA Publication KSI.

##### 1.3 DESCRIPTION OF WORK

- A. Provide safety switches, number as sizes as indicated on the drawings.

##### 1.4 SHOP DRAWINGS

- A. Provide shop drawings on safety switches.

#### PART 2 - PRODUCTS

##### MATERIALS

- A. General: Safety switches shall be NEMA type HD, heavy duty, of the ampere and voltage ratings as required as indicated on the drawings. AH switches shall be UL approved for their intended application.
- B. All switches shall have switch blades which are fully visible in the "OFF" position when the switch door is open. All current carrying parts shall be plated to resist corrosion and to promote cool operation. Switches shall have removable arc suppressers where necessary to permit easy access to line side lugs. Lugs shall be front removable and UL listed for 75 degree F. copper wires.
- C. Switches shall be quick-make, quick-break such that, during normal operation of the switch, the operation of the contacts shall not be capable of being restrained by the operating handle after the closing or opening action of the contacts has started. The operating handle shall be an integral part of the box, not the cover.
- D. Provisions for padlocking the switch in the "OFF" position, with at least three locks, shall be provided.
- E. Switches shall have a dual cover interlock to prevent unauthorized opening of the switch door when the handle is in the "ON" position and to prevent closing of the switch mechanism with the door open. The handle position shall indicate whether the switch is "ON" or "OFF".



- F. Switches shall be furnished in NEMA I general purpose enclosures unless specified as NEMA 3R on the plans. Covers on NEMA I enclosures shall be attached with pin type hinges. NEMA 3R covers shall be securable in the open position.
- G. Enclosures shall be manufactured from galvanized steel. Enclosures shall have a gray baked enamel finish, electro-deposited on cleaned, phosphatized steel.
- H. Switches shall be horsepower rated for AC and/or DC as indicated by the plans.
- I. Fusible switches rated 100 through 600 amperes at 240 volts shall have a UL approved method of field conversion from standard Class H fuse spacing to Class J fuse spacing. The switch also must accept Class R fuses and have provisions for field installation of a UL listed rejection feature to reject all fuses except Class R.
- J. The UL listed short circuit rating of the switches shall be 200,000 rms symmetrical amperes when Class R or Class J fuses are used with the appropriate rejection scheme.
- K. The UL listed short circuit rating of the switch, when equipped with Class H fuses, shall be 100,000 rms symmetrical amperes.
- L. Switches rated 800 and 1200 amperes shall have provisions for Class L fuses and shall have a UL listed short circuit rating of 200,000 rms symmetrical amperes.
- M. Safety switches shall be as manufactured by Square-D, Westinghouse or General Electric.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Install safety disconnect switches where indicated on the drawings.

END OF SECTION 16175



## SECTION 16176

### WIREWAYS

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and Conditions of the Contract, including General Conditions are Supplementary Conditions apply to the work of this Section.

##### 1.2 QUALITY ASSURANCE

- A. Standards: NEMA Publication KSI. Underwriters, Laboratories National Electrical Code 1987.

##### 1.3 DESCRIPTION OF WORK

- A. The electrical Contractor shall furnish and install a complete wireway system of sizes indicated on the drawings or as required by Code.

#### PART 2 - PRODUCTS

##### 2.1 MATERIALS

- A. General: Wireways shall be manufactured in accordance with applicable standards of NEMA and UL for wireways, auxiliary gutters and associated fittings.
- B. Wireway covers and fringes shall be constructed from a minimum of 14 gauge steel before finishes are applied. The end flanges shall be constructed from ten gauge steel
- C. All lengths and fittings shall have smooth, rounded edges to prevent damage to wire and to cable insulation.
- D. Wireways shall be furnished without knockouts.
- E. Wireway covers shall have oil-resistant flow cell gasketing for sealing purposes. A solid oil-resistant neoprene joint gasket shall be used between flanges for rigidity when sections and fittings are bolted together.
- F. A gasketed captive hinged connector which interlocks with the covers shall be used at each joint. The connector shall be such that the covers cannot be closed and latched without closing the sealing connector.
- G. Wireway shall be provided with quick-release cover latches which hold the cover securely in place when closed. Latches shall have provision for a sealing wire to be used when covers are latches are in the closed position.
- H. Wireway covers shall be secured to the troughs with leaf type hinges which allow for full opening access to the Wireway interior.



- I. Wireway lengths and fittings shall be provided with an electrocoated gray epoxy painted finish applied over a corrosion resistant phosphate primer.
- J. The electrical Contractor shall coordinate routing of Wireway with other trades and to suit field condition.
  - 1. Acceptable Manufacturers: Square D, Hoffman or approved equal.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Wireway lengths and fittings shall be securely bolted together with same size slotted paint cutting hex-headed shoulder bolts and hex nuts with captive external tooth lock washers which maintain electrical ground continuity across the joint. Each joint shall be gasketed between end flanges. The sealing cover connector shall be installed so as to be held captive and maintain the lay-in ability of the wireway.
- B. Wireway shall be installed in accordance with National Electrical Code Requirements.
- C. Wireways shall be supported at intervals not exceed five feet unless specially approved for supports at greater intervals. The ten foot straight sections of wireways shall be Underwriter Laboratories, Inc. listed and labeled for support at ten foot intervals.
- D. The approximate routing and length of wiring are shown of the drawings. The electrical Contractor shall be responsible for final routing of wireways and determining actual lengths, fittings and accessories required to complete the installation.

END OF SECTION 16176



## 16000 - Electrical

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### SECTION 16181

#### FUSES (UP TO 600 VOLTS)

##### PART 1 - GENERAL

###### 1.1 RELATED DOCUMENTS

- A. Drawings and Conditions of the Contract, including the General Conditions and Supplementary Conditions apply to the work of this Section.

###### 1.2 DESCRIPTION OF WORK

- A. Provide fuses in fusible devices, including motor starter control circuits, to permit equipment operation.

###### 1.3 QUALITY ASSURANCE

- A. Fuses shall be UL listed and labeled.

###### 1.4 SUBMITTALS

- A. Submit catalog cuts showing manufacturer and type for review.
- B. Submit fuse curves for review.

##### PART 2 - PRODUCTS

###### 2.1 EQUIPMENT

- A. Fuses of ratings above 600 amperes shall be 600 volt, UL Class "L", current limiting, time delay, 200,000 amperes interrupting capacity.
- B. Fuses of ratings 600 amperes and below shall be UL Class RK1, current limiting, time delay, dual element, 200,000 ampere interrupting capacity.

###### 2.2 MANUFACTURERS

- A. All fuses shall be by the same manufacturer to insure selective coordination.
- B. Fuses of ratings above 600 ampere shall be Bussmann KRP-C Hi-Cap or Gould Shawmut A4BY.
- C. Fuses of ratings 600 ampere and below shall be as follows:

250 VOLT

Bussmann LPN-RK

Gould Shawmut A2D-R

##### PART 3 - EXECUTION

###### 3.1 SPARE FUSES



## 16000 - Electrical

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- A. Provide Bussmann Catalog No. SFC spare fuse cabinet(s) or equal by Economy Fuse or Gould Shawmut, quantity as required, at the main distribution panel, in which shall be provided the following spare fuse compliment:
  - 1. Three (3) spare fuses of each ampere rating above 600 ampere.
  - 2. 10% spare fuses of each installed ampere rating and interrupting class (but not less than 3) 600 amperes and below (including fuses installed in main switchboard or in any fusible combination starter or disconnect switch).
- B. Provide a typewritten list of spare fuses at the spare fuse cabinet(s) and frame list in plastic.

END OF SECTION 16181



## 16000 - Electrical

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### SECTION 16190 SUPPORTING DEVICES

#### PART I - GENERAL

##### 1.1 RELATED DOCUMENTS

- A Drawings and Conditions of the Contract, including the General Conditions and Supplementary Conditions apply to the work of this Section.

##### 1.2 DESCRIPTION OF WORK

- A. Provide supporting devices for conduits.
- B. Related Sections: The following Sections contain requirements that relate to this Sections:
  - 1. Section 16110: Raceways
  - 2. Section 16176: Wireways

#### PART 2 - PRODUCTS

##### 2.1 CONDUIT SUPPORTS

- A. All conduit fastenings and supports shall be of approved type. The use of wire, nails, or similar devices for fastening exposed conduits is prohibited.
- B. Threaded inserts, expansion or toggle bolts shall be used for fastening to masonry walls or ceilings.
- C. Where conduits can be grouped together, this arrangement shall be followed and substantial racks of angle iron, pipe or Unistrut structural members shall be provided.
- D. The Electrical Contractor shall furnish and install adequate supporting frame racks of angle iron and/or Unistrut structural members wherever required for the support of wiring troughs, safety switches, motor starters and controls, and associated equipment.
- E. Supporting frames racks shall be rigidly bolted or welded together and adequately braced to provide a substantial structure.
- F. Supporting frames shall be racks mounted on permanent walls wherever practicable. Where free standing supporting frame racks are required, they shall be located in the area as approved by the Plant Engineer to avoid interferences with the normal building operation and maintenance.
- G. Supporting frame racks shall be of ample size to provide for a workmanlike arrangement of all equipment mounted thereon.
- H. No metal enclosures of electrical equipment, or wiring troughs, shall be mounted directly on a masonry wall.





## 16000 - Electrical

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- I. At locations where no supporting frame rack is provided, the Electrical Contractor shall install sufficient Unistrut structural members to provide a minimum of 3/4 inches air space between the wall and metal enclosures.
- J. All hardware, and fittings in wet locations or exposed to the weather shall be constructed of rust and corrosion-resistant materials such as stainless steel, bronze, galvanized malleable iron or shall be galvanized or cadmium plated in addition to the factory or field paint finishes.
- K. Where galvanized or cadmium plated surfaces or materials are cut, drilled, reamed, or damaged during the course of installation, a suitable protective coating shall be applied immediately to prevent the formation of rust or corrosion.
- L. The minimum diameter of round steel rod permissible for hangers and supports is 3/8 inch.

END OF SECTION 16190



## 16000 - Electrical

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### SECTION 16195 ELECTRICAL IDENTIFICATION

#### PART I - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and Conditions of Contract, including General Condition and Supplementary Conditions apply to the work of this Section.
- B. This Section is a Division 16 Basic Materials and Methods Section, and is part of each Division 16 Section Making Reference to Electrical Identification specified herein.

##### 1.2 DESCRIPTION OF WORK

- A. Extent of electrical identification is indicated by drawings and schedules.
- B. Refer to electrical general provision Sections for equipment/system nameplate and performance data.

##### 1.3 QUALITY ASSURANCE

- A. Manufacturers: Firms regularly engaged in manufacture of electrical identification products of types required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Installer: A firm with not less than 5 years of successful experience in installation of raceways similar to those required for this project.
- C. NEC Compliance: Comply with NEC as applicable to installation of identifying labels and markers for wiring and equipment.

##### 1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's product Specifications and installation instructions for each identification material and device required. Include data substantiating that materials comply with requirements.
- B. Samples: Submit samples of each color, lettering style and other graphic representation required for each identification material or system.

#### PART 2 - PRODUCTS

##### 2.1 ACCEPTABLE MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering identification products which may be incorporated in the work include, but are not limited to the following:

Almetek Industries, Incorporated



W.H. Brady Company  
Cole-Flex Corporation  
Griffolyn Company  
Ideal Industries, Incorporated  
LEM Products, Incorporated  
National Band and Tag Company  
Tesa Corporation

## 2.2 ELECTRICAL IDENTIFICATION MATERIALS

- A. Except as otherwise indicated, provide manufacturer's standard products of categories and types required for each application. Where more than single type is specified for an application, selection is installer's option, but provide single selection for each application.
- B. Engraved Plastic-Laminate Signs:
  - 1. Provide engraving stock melamine plastic laminate, complying with FS L-P-387, in sizes and thickness' indicated, engraved with engraver's standard letter style of sizes and wording indicated, black and white core (letter color) except as otherwise indicated, punched for mechanical fastening.
- C. Thickness: 1/16", for units up to 20 sq. in. or 8" length; 1/8" for larger units.
- D. Fasteners: Self-tapping stainless steel screws.

## 2.3 LETTERING AND GRAPHICS

- A. Coordinate names, abbreviations and other designations used in electric identification work, with corresponding designations shown, specified or scheduled.
- B. Provide numbers, lettering and working as indicated or as required for proper identification and operation/maintenance of electrical systems and equipment. Specific wording shall be approved by the engineer.

## PART 3 - EXECUTION

### 3.1 APPLICATION AND INSTALLATION

- A. General Installation Requirements:
  - 1. Coordination: Where identification is to be applied to surfaces which require finish, install identification after completion of painting.
  - 2. Regulations: Comply with governing regulations and requirements or authorities having jurisdiction for identification of electrical work.
  - 3. Operation Identification and Warnings: Wherever reasonably required to ensure safe and efficient operation and maintenance of electrical systems, and electrically connected mechanical systems and general systems and equipment, including prevention of misuse of electrical facilities by unauthorized personnel, install self-adhesive plastic signs or similar equivalent identification, instruction or warnings on switches, outlets and other



## 16000 - Electrical

controls, devices and covers of electrical enclosures. Where detailed instructions or explanations are needed, provide plasticized tags with clearly written messages adequate for intended purposes.

4. Danger Signs: In addition to installation of danger signs required by governing regulations and authorities, install appropriate danger signs at locations indicated and at locations subsequently identified by installer of electrical work as constituting similar dangers for persons in or about project.
5. Critical Switches/Controls: Install danger signs on switches and similar controls, regardless of whether concealed or locked up, where untimely or inadvertent operation (by anyone) could result in significant danger to persons, or damage to or less of property.
6. Equipment/System Identification: install engraved plastic-laminate sign on each major unit of electrical equipment in project; including central or master unit of each electrical system including communication/signal systems, unless unit is specified with its own self-explanatory identification or signal system.

Except as otherwise indicated, provide double line of text, 3/8", high lettering on 1-1/2" high sign, white lettering in black field for items fed from normal circuits and white lettering in red field for items fed from emergency circuits. Provide text matching terminology and numbering of the contract documents and shop drawings. Provide signs for each unit of the following categories of electrical work:

Panelboards, electrical cabinets and enclosures

Electrical Switchgear

Transformers

Starters

Disconnects

Junction boxes large than 8" x 8"

Circuit breaker enclosure

Emergency receptacles and switches

The following are samples:

Panels	Panel XXX	XXX AMPS
	XXX/XXX Volts	X Phase X Wire
Equipment	(Equipment Name)	
	Panel XXX	Circuit XX
Disconnect	(Equipment Name)	
	Panel XXX	Circuit XX

- B. Install signs of locations indicated or, where not otherwise indicated, at location for best convenience of viewing without interference with operation and maintenance of equipment. Secure to substrate with fasteners.



## 16000 - Electrical

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- C. Furnish and install a framed, full-size print of the electrical riser and distribution systems (emergency and normal). include the main service entrance equipment, distribution panels, branch circuit panels, transformers, motor control centers, transfer switches, emergency generator, emergency distribution panels, emergency branch circuit panels, etc.
- D. Each piece of electrical equipment shall be shown on the print and identified with identical terminology as shown on the engraved plate on each piece of equipment installed throughout the building.
- E. Prior to installation, this "Record Drawing" shall be approved as accurate by the Electrical Design Engineer and shall carry an identifying stamp certifying it has been reviewed and approved.
- F. This print shall be framed in a suitable wooden frame under glass and installed in the main service entrance equipment room at a location designated by the owner. The print size shall be a minimum of 24" x 36".

END OF SECTION 16195



## SECTION 16211

### MOTOR GENERATOR SETS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials to include repair and maintenance of motor generator sets. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
- 2.1 Batteries: SAE J537 and UL 1236, and IEEE 484 and 485.
- 2.2 Instrument Transformers: ANSI CI2-11.
- 2.3 Motor and Generator: NEMA MG-1 and MG-2.
- 2.4 Battery Charger: UL 1236.
- 2.5 Switchgear: NEMA SG-5.
- 2.6 Electrical Instruments: ANSI C39.1.
- 3.0 EXECUTION:
- 3.1 Coordination and Scheduling: Outages shall be scheduled and coordinated in advance with the Contracting Officer.
- 3.2 Protection: Take precautions to prevent injury to personnel and to avoid damage to equipment and other property in compliance with ANSI C2.
- 3.4 Maintenance, Repair, or Replacement Work: The Contractor shall check the generator sets in accordance with the manufacturer's instructions and IEEE-43, IEEE-115, and SSPC-PA-1. As a result of the testing or for preventive maintenance, the Contractor shall maintain, repair, or replace any piece of equipment requiring work.

END OF SECTION 16211



## SECTION 16252

### UNINTERRUPTIBLE POWER SYSTEM (UPS)

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials to include repair and maintenance of uninterruptible power systems. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS
  - 2.1 Batteries: NEMA IB 7 or Fed. Spec. W-B-137, as applicable.
  - 2.2 Battery Charger: UL 1236.
  - 2.3 Switchgear: NEMA SG-5.
  - 2.4 Emergency and Standby Power Systems: IEEE No. 446.
- 3.0 EXECUTION
  - 3.1 Coordination and Scheduling: Outages shall be scheduled and coordinated in advance with the Contracting Officer.
  - 3.2 Protection: Take precautions to prevent injury to personnel and to avoid damage to equipment and other property in compliance with ANSI C2.
  - 3.3 Maintenance, Repair, or Replacement Work: The Contractor shall check the UPS in accordance with the manufacturer's instructions and IEEE 446. If instructed by the Contracting Officer, the Contractor shall check for electromagnetic compatibility. As a result of the testing or for preventive maintenance, the Contractor shall maintain, repair, or replace any piece of equipment requiring work.

END OF SECTION 16252



## SECTION 16300

### ELECTRICAL DISTRIBUTION SYSTEM SUBSTATION EQUIPMENT

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials to include repair and maintenance of electrical distribution system substation equipment. Products be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS: The maintenance and repair work shall include but not be limited to the following major equipment:
- a. Power Transformers.
  - b. Station Service Transformers.
  - c. Automatic Tap Changing Transformers.
  - d. Switchgear.
  - e. Oil Circuit Breakers.
  - f. Isolating Switches.
  - g. Metering Equipment.
  - h. Relaying Equipment.
  - i. Station Battery System.
  - j. Articulated Secondary Unit Substation.
  - k. Integral Transformer-Load Center.
- 2.1 Power Distribution Panel: Fed. Spec. W-P-II5.
- 2.2 Insulating Oil, Electrical (For Transformers, Switches, and Circuit Breakers): Fed. Spec. VV-I-530.
- 2.3 Distribution, Power, and Regulating Transformers: ANSI C57.12 series as applicable.
- 2.4 Instrument Transformers: ANSI C57.13.
- 2.5 Installation and maintenance of Oil-Immersed Transformers: ANSI C57.93.
- 2.6 Voltage Air Switches, Bus Supports, and Switch Accessories: ANSI C37.32.
- 2.7 Low-Voltage AC Power Circuit Breakers: ANSI C37.50.
- 2.8 Electrical Analog Indicating Instruments: ANSI C39.1.
- 2.9 Primary Unit Substation: NEMA 201.
- 2.10 Secondary Unit substation: NEMA 210.
- 2.11 Molded Case Circuit Breakers: NEMA ABL.
- 2.12 Watthour Meters: NEMA EI 20.
- 2.13 Switchboards, Dead Front Distribution: NEMA PB 2.





3.0 EXECUTION:

- 3.1 Coordination and Scheduling: Outages shall be scheduled and coordinated in advance with the Contracting Officer.
- 3.2 Protection: Precautions shall be taken to prevent injury to personnel and to avoid damage to equipment and other property in compliance with ANSI C2.
- 3.3 Workmanship: Work shall be completed in accordance with NFPA-70 and NFPA-70B.
- 3.4 Interruptions: During interruptions, equipment and standby systems shall be provided to maintain existing electrical service.
- 3.5 Fences shall be checked for security. Gates and locks shall be checked for proper operation and grounding.
- 3.6 Oil Handling and Disposal: Oil and oil-contaminated materials shall be handled and disposed of to comply with the latest federal and state requirements.

END OF SECTION 16300



## SECTION 16330

### TRANSFORMERS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials to include repair and maintenance of transformers. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
  - 2.1 Transformer Assemblies and Components for replacement purposes shall be designed for the same service as existing.
  - 2.2 Transformers covered under this specification are as follows:
    - 2.2.1 Dry Type Transformers.
    - 2.2.2 Instrument Transformers.
    - 2.2.3 Control Transformers.
    - 2.2.4 Grounding Transformers.
    - 2.2.5 Liquid-Filled Transformers.
- 3.0 EXECUTION:
  - 3.1 Safety: Take precautions in compliance with the National Electrical Safety Code, ANSI C2; execute work in compliance with NFPA 70 and 70B.
  - 3.2 Coordination: Coordinate the work schedule with the Contracting Officer.
  - 3.3 Repairs: Repair and retighten burnt or broken lugs, windings, loose bolts, nuts, and screws. Repair windings in accordance with NEMA ST 20.
  - 3.4 Testing: Perform electrical insulation tests to verify the integrity of any repairs prior to re-energization of the transformers.
  - 3.5 Oil Handling and Disposal: Handle and dispose of oil and oil contaminated materials in compliance with the latest environmental Protection Agency requirements.
  - 3.6 Deficiencies, Safety Hazards, and Code Violations: Should the Contractor find or observe any deficiency, safety hazard, or code violation in the existing electrical system, equipment, devices, or installations that is not indicated or specified to be corrected under the contract, it shall be promptly reported to the Contracting Officer. The Contractor may submit recommendations for correction of the deficiency, safety hazard, or code violation with his report.
  - 3.7 Additional Execution Requirements Specific to Each Type of Transformer:
    - 3.7.1 Dry Type Transformers:



- 3.7.1.1 General: Replacement transformers shall have a winding configuration identical to that of the existing transformer and shall comply with NEMA ST 20 and ANSI C57.12.22.
- 3.7.1.2 Noise Isolation Pads shall be checked for excessive wear and replaced if necessary.
- 3.7.1.3 Dust shall be cleaned from transformer winding and enclosure ventilation louvers.
- 3.7.2 Instrument Transformers:
  - 3.7.2.1 Current Transformers shall be manufactured in compliance with NEMA EI 21 and shall have an accuracy Class of 0.6 at burden designation of B-0.1 and B-0.2 and an accuracy of 1.2 at B-0.5 as defined in ANSI C57.13 for instrument transformers.
  - 3.7.2.2 Potential Transformers shall have an accuracy of 0.3W, 0.3X, 0.3Y, 1.2Z as defined in ANSI C57.13 for instrument transformers.
  - 3.7.2.3 Fuses: Potential transformers shall be protected on the high and low voltage side by fuses.
  - 3.7.2.4 Repair: No attempt to repair current or potential transformers shall be made.
- 3.7.3 Control Transformers:
  - 3.7.3.1 Core shall be in compliance with UL 506.
  - 3.7.3.2 Fuses: All ungrounded conductors of primary and secondary of potential transformers shall be protected by fuses.
  - 3.7.3.3 Repair: No attempt to repair control transformers shall be made.
- 3.7.4 Grounding Transformers:
  - 3.7.4.1 Replacement Zig-Zag Grounding Transformers shall be three-phase zig-zag auto-transformers or six single-phase transformers connected zig-zag and shall comply with UL 506.
  - 3.7.4.2 Replacement Wye-Delta Grounding Transformers shall be three-phase transformers or three single-phase transformers connected wye-delta and shall be in compliance with ANSI C57.12.00.
  - 3.7.4.3 Core shall be in compliance with ANSI C57.12.00.
- 3.7.5 Liquid-Filled Transformers:
  - 3.7.5.1 Replacement Oil-Filled Transformers shall have a winding configuration identical to the existing transformer and shall comply with ANSI C57.12.00.
  - 3.7.5.2 Gaskets shall match existing type removed.
  - 3.7.5.3 Repair Leaks by cleaning the leak area and welding or by applying 1/4-inch thick steel plate patch and welding in place. After welding, check the repaired area for leaks, reweld if leaking, reclean, and touch up with paint. Welding shall comply with AWS D1.1.
  - 3.7.5.4 Gaskets, Vacuum, and Liquid Level Gauges found to be defective shall be replaced.
  - 3.7.5.5 Ground Resistance Test Readings shall be performed across phase-to-phase windings and phase-to-ground windings. Record and submit results to the Contracting Officer
  - 3.7.5.6 Dielectric Test shall be performed on oil samples taken from top and bottom filter press connections. Record and submit results to the Contracting Officer.



## 16000 - Electrical

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- 3.7.5.7 Transformer Liquid Levels shall be checked for correct level and filled if low. Oil added to transformers shall be an oil recommended by the transformer manufacturer. Dielectric strength of oil shall not be less than 30 kV. Mineral oil shall comply with NEMA TR P8. Mineral oil shall not be added to high- fire point oils such as silicone.
- 3.7.5.8 Transformer Tap Connections and tap changer shall be tightened.
- 3.7.5.9 Pressure of Inert Gas in cylinders used to maintain positive pressure inside transformer tank shall be checked. Replace cylinder if pressure fails below transformer manufacturer's recommended level for gas cylinder pressure.
- 3.7.6 Outages and Testing of Transformers:
  - 3.7.6.1 Service Interruptions shall be held to a minimum. De-energization will be accomplished by Corpus Christi Army Depot or their representative.
  - 3.7.6.2 Pre- installation Test: Existing transformers that have undergone major maintenance and/or repair shall be subjected to insulation resistance tests and insulation high potential tests as outlined in NFPA 70B. The results of the tests shall be furnished to the Contracting Officer.
  - 3.7.6.3 Oil Test: Transformers shall have insulating oil tested.
  - 3.7.6.4 Insulation Test: Transformers shall have insulation tested.

END OF SECTION 16330



## SECTION 16411

### UNDERGROUND ELECTRICAL DISTRIBUTION SYSTEMS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials to include repair and maintenance of underground electrical distribution systems. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Service Entrance Conductors:
- 2.1.1 Underground or Overhead Electric Service Entrance Conductors shall consist of Underwriters Laboratory approved Type USE single conductors rated for 75 Degrees temperature for use in dry or wet locations with RHW insulation. These conductors shall be either (1) the type with a heat and moisture rubber compound insulation with a neoprene sheath or (2) the type using a cross-linked polyethylene jacketed insulation (rated as USE) as manufactured by the Phelps Dodge Cable and Wire Company or the Triangle Conduit and Cable Company.
- 2.1.2 Cable shall be marked "Type USE-600V-75 Degrees C. Cable shall be capable of operating continuously at a temperature of 75 Degrees C in both wet and dry locations. Copper in these conductors shall be tinned where a type with a rubber compound insulation is furnished. The copper conductors need not be tinned where a polyethylene jacket type is furnished.
- Cable shall meet the requirements of ASTM-D-1679 and ASTM-D-752 specifications for the Rubber Insulated Type. The Cross-Linked Polyethylene Type shall meet all the requirements of Underwriters Laboratories Standards No. 854 and 44, NEMA Pub. No. WC7 and IPCEA Publication No. S-66-524.
- This type cable shall also be used for the following:
- A. Installations between Service Switches and Main Distribution Centers.
  - B. Installations in Conduits in Contact with the earth.
  - C. Installations of Conduits in Concrete Slab in Contact with the earth.
  - D. Installation of Conduits on the exterior of the building.
- 2.2 High Tension Conductors: High tension conductors shall be employed on Systems operating on potential greater than 600 volts but not exceeding 5000 volts. This Contractor shall submit to the Contracting Officer for approval, four copies of certified test data that the high tension conductors are suitable for the duty they shall perform and are acceptable to the Contracting Officer
- 2.3 Tapes: All tapes for covering splices in wires, etc., shall comply with the following specifications:
- 2.3.1 Friction Tape: Friction tape shall comply with the latest specification of the ASTM and shall be so marked on each box.



## 16000 - Electrical

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- 2.3.2 Rubber Tape: Rubber tape shall comply with the latest specifications of the ASTM and shall be so marked on each box. Tape shall be 3/4 inch, wide, 0.030 inch thick.
- 2.3.3 Plastic Tape: Plastic tape shall be 3/4 inch wide, 0.007 inch thick, the approved equal of 3-M "Scotch" No. 33 electrical tape.
- 2.3.4 Surface slickness shall comply with the latest ST-ASTM specification.

END OF SECTION 16411



## SECTION 16413

### OVERHEAD ELECTRICAL DISTRIBUTION SYSTEMS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials to include repair and maintenance of overhead electrical distribution systems. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Conductors: Fed. Spec. J-C-I45, QQ-W-343, ANSI C2, C7.8, C7.18, c7.19, C7.20, C7.21, C7.22, C8.35, NEMA WC3, WC5, and WC7.
- 2.2 Insulators: ANSI C29.1, C29.2, C29.3, C29.4, C29.5, C29.6, C29.7, C29.8, C29.9, and EEI TD-24.
- 2.3 Poles: ANSI 05.1, AWP4 C4, C25, PI, P8, P9, and CSA A14. 1.
- 2.4 Crossarms: EEI TD-90 and TD-91.
- 2.5 Hardware: EEI TDJ-I, TD-2, TDJ-3, TD-4, TDJ-5, IOJ-6, TDJ-7, TDJ-9, TDJ-IO, TD-II, TD-I2, TDJ-I7, TDJ-22, and TDJ-23 as applicable.
- 2.6 Right of Way Clearing: EEI-K-IO.
- 3.0 EXECUTION:
- 3.1 Scheduling and Coordination: Contractor shall ensure that power interruptions and blocking of thoroughfares have been scheduled and approved.
- 3.2 Line Clearing: Chemicals used in line clearing operations shall be in compliance with the latest federal and state requirements.
- 3.3 Safety Precautions: Precautions shall be taken to prevent injury to personnel and to avoid damage to equipment and other property in compliance with ANSI C2.

END OF SECTION 16413



## 16000 - Electrical

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### SECTION 16431

#### ELECTRICAL DISTRIBUTION SYSTEM CAPACITOR BANKS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of electrical distribution system capacitor banks. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Material: New capacitors shall comply with NEMA CPI and shall not use impregnate containing polychlorinated biphenyls (PCB)..
- 3.0 EXECUTION:
- 3.1 Outages shall be scheduled and coordinated in advance with the Contracting Officer.
- 3.2 Protection: Take precautions to prevent injury to personnel and to avoid damage to equipment and other property in compliance with ANSI C2.
- 3.3 Maintenance and Repair Work: Workmen shall allow the capacitor time to discharge and then short capacitor terminals together and ground before touching any live parts. Capacitors shall be checked in accordance with NEMA CPI and NFPA 70, Perform the necessary preventative maintenance, repair, or replacement of any of the components.
- 3.4 Oil Handling and Disposal: Oil and oil-contaminated materials shall be handled and disposed of to comply with the latest Environmental Protection Agency requirements.

END OF SECTION 16431





## SECTION 16432

### ELECTRICAL DISTRIBUTION SYSTEM VOLTAGE REGULATORS

- 1.0. DESCRIPTION OF WORK: This specification covers the furnishing and installation of electrical distribution system voltage regulators. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
- 2.1 Material: New regulators shall comply with ANSI C57.I. New oil shall comply with Fed. Spec. VV-I-53O.
- 3.0 EXECUTION::
- 3.1 Outages shall be scheduled and coordinated in advance with the Contracting Officer.
- 3.2 Protection: Take precautions to prevent injury to personnel and to avoid damage to equipment and other properties in compliance with ANSI C2.
- 3.3 Maintenance and Repair Work: All maintenance and repair work shall be accomplished and in compliance with applicable ANSI C57-series and ASTM standards.
- 3.4 Oil Handling and Disposal: Oil and oil-contaminated materials shall be handled and disposed of to comply with the latest Environmental Protection Agency requirements.
- 3.5 Test Reports on field tests made in compliance with ANSI C57.15 shall be submitted to the Contracting Officer.

END OF SECTION 16432



## SECTION 16450

### ELECTRICAL DISTRIBUTION SYSTEM GROUNDING

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of electrical distribution system grounding. Products shall be directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS : (Section not used.)
- 3.0 EXECUTION:
- 3.1 Grounding:
- A secondary system ground and an interior conduit ground shall be installed as follows:
- 3.1.1 Grounding Busbar:
- 3.1.1.1 A grounding busbar, at the point of entrance of the main water pipe, shall be attached to the water pipe on the street side of the water valve.
- 3.1.1.2 The ground wires and conduits from the secondary service, fire alarm system, fire signal system, sprinkler alarm system the grounding conduit of public telephone conduit system and television conduit system shall be separately attached to this busbar.
- 3.1.1.3 The grounding busbar shall consist of two three-inch by 1/4-inch "tinned" copper bars, one longer than the other formed around the opposite sides of the water pipe and held together and against the water pipe by means of four copper plated iron bolts. The longer bar shall extend away from the water pipe and shall be drilled to separately receive all conduits connections. An additional 3-inch x 1/4" copper bar, attached to the hereinbefore specified long busbar shall be provided for attaching solderless lugs of ground wires.
- 3.1.1.4 Each terminal shall be identified by an approved stamped identification (such as "Main"; "F.A."; "F.S."; etc.) "stamped into busbar adjacent to terminal.
- 3.1.1.5 A detailed drawing of "ground busbar" shall be submitted for approval before installation is made.
- 3.1.1.6 A Thomas and Betts No. 670 grounding fitting may be installed for an isolated single grounding connection.

END OF SECTION 16450



## SECTION 16460

### ELECTRICAL DISTRIBUTION TRANSFORMERS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of electrical distribution transformers. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
  - 2.1 Poles-Mounted Transformers: Fed. Spec. W-T-63I and ANSI C 57.12 series as applicable.
  - 2.2 Pad-Mounted Transformers: Fed. Spec. W-T-63I, NEMA IR-I, ANSI C 57.12 series as applicable.
  - 2.3 Transformer Oil for Oil-Filled Units: Fed. Spec. VV-I-53O.
- 3.0 EXECUTION:
  - 3.1 Outages shall be scheduled and coordinated in advance with the Contracting Officer.
  - 3.2 Protection: Take precautions to prevent injury to personnel and to avoid damage to equipment and other property. in compliance with ANSI C2.
  - 3.3 Preventive Maintenance, Repair, or Replacement Work: The Contractor shall perform all required tests in accordance with applicable codes and standards and the manufacturer's instructions. The Contractor shall perform preventive maintenance work, repair, replacement of any defective part, or furnish new material when required.
  - 3.4 Oil Handling and Disposal: Oil and oil-contaminated materials shall be handled and disposed of in compliance with the latest Environmental Protection Agency requirements. Oil tests shall be in accordance with ASTM standards.
  - 3.5 Reports: Upon completion of the work, a report of the results of the tests made shall be furnished to the Contracting Officer.

END OF SECTION 16460



## SECTION 16461

### DRY TYPE TRANSFORMERS (600 VOLTS AND BELOW)

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. The general provisions of the Contract, including Conditions of the Contract and Division I of the Specifications, apply to this Section.

##### 1.2 DESCRIPTION OF WORK

- A. Provide transformers with ratings and special features as herein specified.
- B. Transformers to be continuously rated isolation/suppression type for 60 Hertz service unless otherwise indicated.
- C. The transformer shall conform to Underwriter's Laboratories (UL) Standard 506 for dry type transformers.

##### 1.3 SHOP DRAWINGS

- A. Submit shop drawings to include the following:
  - 1. Elevations, dimensions, weight, technical data sheet and ratings.

#### PART 2 - PRODUCTS

##### 2.1 MAJOR SYSTEM COMPONENTS

- A. The transformer shall include a coil and core constructed with NEMA type metal enclosure. It shall contain the suppression networks necessary to achieve isolation/suppression for the system. The unit shall be preassembled and fully tested as a system prior to shipment.
- B. The transformer shall have two electrostatic shields per coil for maximum noise attenuation. Both shields shall be of foil construction with one located between the core and the secondary winding. The transformer shall have a dry type 220°C rated insulation system. Transformer windings, lugs and taps shall be copper.

Transformer coil shall be impregnated with non-hygroscopic thermosetting varnish.

##### 2.2 SYSTEM PACKAGING AND CONSTRUCTION

- A. The transformer shall be designed for location in an environment suitable to its operating characteristics. The design shall address personnel safety, performance, equipment safety and maintainability.
- B. The major system components shall be packaged in a single vertical enclosure, mounted on skid type frame.
- C. The metal enclosure shall be sized according to applicable UL requirements.



- D. All sheet metal shall be 14 gauge or better.

2.3 ELECTRIC CHARACTERISTICS

- A. The electrical characteristics shall be as follows:

RATING

1. The full load rating shall be 75 kva, 60 hertz.
2. Input Voltage: 208 volts, 3 phase, 3 wire plus ground.
3. Output Voltage: 208 volts, 3 phase, 4 wire plus ground.

- B. The transformer core and coil shall be designed to operate with neutral current 200% of phase current when supplying switching regulator power supply loads.

OPERATING FREQUENCY

60 Hz 57 - 63 Hz

ENVIRONMENT

Ambient Temperature: 0°C + 40°C

Storage Temperature: 15°C + 50°C

Operating Humidity: 0 - 90%

Audible Noise: Less than 45 dBA at 5 feet

TAPS

Six on Primary: 2 Full Current Above Nominal (FCAN) 4 Full Current

Below Nominal (FCBN)

Each Tap: 2-1/2% Nominal Change

2.4 MAGNETIC FIELD STRENGTH

- A. The magnetic field strength around the transformer shall be less than 0.1 gauss at 1.5 feet.

ELECTRICAL NOISE ATTENUATION

Common Mode: -146dB

Transverse Mode: 40dB per decade

Efficiency: 98.0% Nominal

Impedance: 6. 1% Maximum

Regulation System:  $\pm 1.3\%$  (No load to full load)

Insulation System: 220°C

Output Distortion: None added

Percent Reactance: Minimum 3.0%

Maximum 5.4%



## 16000 - Electrical

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Average Temp.Rise: Maximum 150°C

### TRANSIENT SUPPRESSION

Peak Transient Current: 30,000 amps (8 x 20 microsec. wave)

Max Clamping Voltage: 360v at 1,000 amps

Poise Transient Energy: 420 joules

Response Time: < 25 nano second

### PRIMARY SURGE PROTECTION

Peak Transient Current: 40,000 amps

10 Microsec, Rise Time: 2.9 kV

## 2.5 TRANSFORMER ALARMS

A. The following alarms and alarm contacts shall be provided:

1. Transient Suppression Status Indicator - An illuminated red light to alert the user to replace the suppresser and fuse stressed by a high energy impulse.
2. Over Temperature Sensors - Two thermal switches shall be wound in the center coil "hot spot" of the transformer to provide two stage thermal alarm sensing. The switches shall be normally open contacts, one set for 180°C and one set for 195°C. The switches shall be wired to a terminal block mounted on top of the transformer frame inside the cabinet.

## 2.6 GROUNDING

A. The transformer case and both electrostatic shield shall be grounded via a full sized (partly) green or green with yellow stripe insulated copper grounding conductor. The transformers neutral shall be bonded to the grounding conductor.

## 2.7 FACTORY TESTING

A. The transformer shall be completely factory tested prior to shipment. As a minimum, the following tests shall be performed:

1. Full Load Tested to rated value.
2. Complete High Potential (Hi-Pot) test.
3. Windings of 250 volts and below - 2.5 kV
4. Windings above 250 volts - 4.0 kV.

## 2.8 DOCUMENTATION

A. The manufacturer shall furnish the Corpus Christi Army Depot an instruction manual covering the installation, operation and maintenance of the transformer.

## 2.9 WARRANTY

A. The manufacturer shall guarantee the transformer against defective material and workmanship for a period of one year from the date of formal acceptance by the Corpus Christi Army Depot. The core and coil assembly shall be warranted for an additional forty-eight (48) months.



2.10 ACCEPTABLE MANUFACTURERS

- A. ABB or approved equal.

PART 3 - EXECUTION

3.1 TRANSFORMS

- A. Securely mount transformers at location indicated on drawings and as described above.

END OF SECTION 16461



## 16000 - Electrical

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### SECTION 16471

#### PANELBOARDS AND LOAD CENTERS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials to include repair and maintenance of panelboards and load centers. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
  - 2.1 Panelboards: NEMA PB 1, and PB 1.1
  - 2.2 Fuses and Fuse Holders: ANSI/UL 512, 198
  - 2.3 Molded Case Circuit Breakers: NEMA AB 1.
  - 2.4 General Electrical: NFPA 70 and 70B
  - 2.5 Enclosures Beyond Repair: Replace with the same size and type in compliance with NEMA ICS. Carbon steel, ASTM A 366; stainless steel, ASTM A 176; galvanized sheet steel, ASTM A 526.
- 3.0 EXECUTION:
  - 3.1 Coordination: Contractor shall determine that equipment served by panelboards and load centers will not be damaged before or after power is cut off and that power to the panelboards and load centers has been disconnected or cut off.
  - 3.2 Clearances: Working clearances required by NFPA 70 shall be provided to the Contracting Officer.
  - 3.3 Test: All devices and systems that have undergone maintenance, repair or new installation shall be tested before placement in service

END OF SECTION 16471





## SECTION 16480

### ELECTRIC MOTORS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials to include repair and maintenance of electric motors. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
  - 2.1 General: Parts shall be factory-made. Existing bolts and screws that are rusted, corroded, cross-threaded, or otherwise defective and are removed due to repair work shall be replaced with new bolts and screws.
  - 2.2 Motor Assemblies and Components for replacement purposes shall be furnished to equal the service in which the motor is involved as well as the same service factor. Repaired rotors shall be balanced. Brushes worn to within 20 percent of usable length shall be replaced with same type and size brushes.
  - 2.3 New Motor shall be of like kind and of the same size and have the same service factor and RPM, and voltage (submit motor efficiency), performance rating, and characteristics as the existing motor to be replaced and shall comply with NEMA MG 1, UL 1004, and Fed. Spec. CC-M-1807.
  - 2.6 Products included in these specifications are:
    - 2.4.1 Single Phase Induction Motor.
    - 2.4.2 Universal Motor.
    - 2.4.3 Polyphase Squirrel-Cage Induction Motor.
    - 2.4.4 Polyphase Wound Rotor Induction Motor.
    - 2.4.5 Polyphase Synchronous Motor.
    - 2.4.6 Direct Current Motor.
- 3.0 EXECUTION:
  - 3.1 Compliance: Take precautions in accordance with the National Electrical Safety Code. Workmanship shall be executed in compliance with NFPA 70 and 70B.
  - 3.2 Scheduling and Coordination: the Contracting Officer shall determine that required notices have been given and that equipment served by the motor will not be damaged due to motor shutdown.
  - 3.3 Lubrication, Operation, and Adjustment: Before operational testing, thoroughly clean electric motor of all foreign material, and lubricate all electric motors or parts requiring lubrication with the types of lubricants recommended by the electric motor manufacturer.



## 16000 - Electrical

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- 3.4 Deficiencies, Safety Hazards, and Code Violations: Should the Contractor find or observe any deficiency, safety hazard, or code violation in the existing electrical system, equipment, devices, or installations that are not indicated or specified to be corrected under the contract, it shall be promptly reported to the Contracting Officer. The Contractor may submit recommendations for correction of such deficiency, safety hazard, or code violation with his report and cost.
- 3.5 Requirements Specific To Each Motor Type:
- 3.5.1 Single-Phase Induction Motors:
- 3.5.1.1 Single-Phase Induction Motors shall comply with ANSI C50.21.
- 3.5.1.2 Frame Sizes shall comply with NEMA MG 13.
- 3.5.2 Universal Motors:
- 3.5.2.1 Armature: Core of armatures shall be built up of annealed and insulated laminations. Commutator shall be built up of hard drawn, hard rolled copper segments insulated from each other by mica in compliance with NEMA MG 1.
- 3.5.2.2 Armature Assembly shall be dynamically balanced for smooth operation in compliance with NEMA MG 1.
- 3.5.2.3 Bearings shall be sleeve bearing or ball bearing type complying with NEMA MG 1.
- 3.5.2.4 Brushholders shall be in compliance with NEMA MG 1.
- 3.5.2.5 Brushes shall be in compliance with NEMA CB 1.
- 3.5.2.6 Shaft shall be in compliance with NEMA MG 1.
- 3.5.3 Polyphase Squirrel-Cage Induction Motors:
- 3.5.3.1 Polyphase Squirrel-Cage Induction Motors shall comply with NEMA MG 1.
- 3.5.3.2 Frame Size shall comply with NEMA MG 13.
- 3.5.4 Polyphase Wound Rotor Induction Motors:
- 3.5.4.1 Polyphase Wound Rotor Induction Motor shall comply with NEMA MG 1.
- 3.5.4.2 Frame Size shall comply with NEMA MG 13.
- 3.5.4.3 Brushes shall be in compliance with NEMA CB 1.
- 3.5.4.4 Stator shall be rewound with conductors of same gauge and material as the existing stator.
- 3.5.4.5 Rotor shall be rewound with conductors of same gauge and material as the existing rotor.
- 3.5.5 Polyphase Synchronous Motors:
- 3.5.5.1 Polyphase Synchronous Motor shall comply with NEMA MG 1.
- 3.5.5.2 Frame Size shall comply with NEMA MG 13.
- 3.5.5.3 Brushes shall comply with NEMA CB 1.
- 3.5.6 Direct Current Motors:



## 16000 - Electrical

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- 3.5.6.1 Armature core shall be built up of annealed and insulated laminations. Commutator shall be built up of hard drawn, hard rolled copper segments insulated from each other by mica in compliance with NEMA MG 1.
- 3.5.6.2 Armature Assembly shall be dynamically balanced for smooth operation in compliance with NEMA MG 1.
- 3.5.6.3 Bearings shall be ball bearing or sleeve bearing type in compliance with NEMA MG 1.
- 3.5.6.4 Brushholders shall be in compliance with NEMA MG 1.
- 3.5.6.5 Frame size shall comply with NEMA MG 13.
- 3.5.6.4 Shaft shall be in compliance with NEMA MG 1.
- 3.5.6.7 Brushes shall be in compliance with NEMA CB 1.
- 3.6 Outages and Testing of Electric Motors:
- 3.6.1 Outages and service interruptions shall be held to a minimum. De-energization will be accomplished by the Contracting Officer.
- 3.6.2 Pre-installation Test: Existing motors that have undergone major maintenance and/or repair shall be subjected to insulation resistance tests and insulation high potential tests as outlined in HFPA 70B. Furnish the results of the tests to the Contracting Officer.

END OF SECTION 16480



## SECTION 16491

### HIGH-VOLTAGE DISCONNECTING DEVICES.

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials to include repair and maintenance of high-voltage disconnecting devices. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
  - 2.1 Insulating Oil: Fed. Spec. VV-I-530a and ASTM standards applicable to the oil in use.
  - 2.2 General Electrical: ANSI C2.
  - 2.3 Power Fuses and Fuse Disconnecting Switches: ANSI C37.46, NEMA SG-2.
  - 2.4 Automatic Circuit Reclosers For AC Systems: ANSI C37.60.
  - 2.5 Automatic Line Sectionalizers For AC Systems: ANSI C37.63, C37.63a.
  - 2.6 Power Switching Equipment: NEMA SG 6.
  - 2.7 Distribution Cutouts and Arrestor Combination Mounting: NEMA 100.
- 3.0 EXECUTION:
  - 3.1 Scheduling and Coordination: Contractor shall ensure that power interruptions have been scheduled and approved.
  - 3.2 Protection: Precaution, in compliance with ANSI C2, shall be taken to prevent injury to personnel and to avoid damage to equipment and property.
  - 3.3 Oil Handling and Disposal: Oil and oil contaminated materials shall be handled and disposed of to comply with the latest federal and state regulations.

END OF SECTION 16491



## SECTION 16492

### INTERIOR LOW-VOLTAGE DISCONNECTING DEVICES

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials to include repair and maintenance of interior low-voltage disconnecting devices. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
  - 2.1 Safety Switches:
    - 2.1.1 Safety switches shall be non-fused unless otherwise directed. If fused, fuse clips shall be provided to accommodate same. Safety switch shall have nameplate on front giving voltage, amperage and number of poles. Enclosure shall have baked gray enamel finish. Where voltages exceed 120/208 volts all safety switches shall be NEMA 2, heavy duty type.
      - 2.1.1.1 When a safety switch is required, furnish and install a Square "D" (80,000) Series), or Bull Dog, or other equal. Underwriters approved (NEMA General Purpose switch of size indicated on drawings.
    - 2.1.2 Standard Type: Service Switches of the Standard Type shall be Underwriter's approved, NEMA -Type ND - (Normal Duty) quick make and quick break mechanism in general purpose enclosure. When an interlock is furnished, provide means of voiding same for access to fuses under load.
    - 2.1.3 Pressure Type: Pressure Type Switches shall be of the bolted pressure load, break type or approved equivalent, such that switch mechanism shall provide sliding contact pressure at jaws during opening or closing of switch, and positive bolted pressure when switch is in closed position. Switch contacts, fuse terminals, as well as line and load terminals shall be silver or pure tin plated. Switch shall meet Underwriters Laboratory and NEMA Standards for service equipment, and shall be the approved equal of Pringle Electric Manufacturing Company, Square 'D' or Federal Pacific.
  - 2.2 Fuses: Fuses installed in the Service Switches and Main Distribution Center shall be coordinated into a selective system of over current protection. Fuse gap sections for switches requiring above 600-amperes shall be for stud mounting, interchangeable, high interrupting capacity, current limiting, silver sand type fuses. Fuse gaps for fuses 600-amperes and below shall be of the N.E.C. Type. All fuses including spares shall have a minimum interrupting rating of 200,000 rms amperes the equal of Bussman and Chase Shawmut. See Section 16-4.35 for spares.
- 3.0 EXECUTION:
  - 3.1 Not Used
  - 3.2 All work at the service shall be performed in accordance with the Utility Company's rules and regulations; to the satisfaction of the Contracting Officer.



## 16000 - Electrical

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- 3.3 In connection with Service Work, the Contractor shall apply for and receive from the Utility Company information relative to the requirements for property line splice boxes, meter pans, meter blocks, all metal enclosures, current transformer cabinets, meter loops, service meter wiring, etc.
- 3.4 The Contractor shall note that after the contract award, the final approved equipment, current transformer cabinet and meter provisions, including property-line box and service end boxes shall be of the type which includes terminating devices (crab-joints) and protective devices (limiters), connections, hardware and etc.
- 3.5 Not Used
- 3.6 Electric Service equipment shall be designed for a minimum short circuit stress of 100,000 amperes r.m.s. symmetrical.
- 3.7 Any work the Utility Company performs as part of this installation which is chargeable to the project shall be paid for by this Contractor as a part of this Contract.

END OF SECTION 16492



## SECTION 16524

### STREET AND AREA LIGHTING CONTROLS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for street and area lighting controls. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
  - 2.1 Photocontrols shall be of the light-sensitive photo conductor cell type with integral line resistor and relay circuit having a line voltage circuit contact and capacitor and an across-the-line protective lightning arrester.
  - 2.2 Replacement Relay for control of circuit shall match mounting, voltage, and wattage of existing relay.
  - 2.3 Electronic Control Units shall be solid-state, transistorized, printed circuit type having no operating moving parts.
- 3.0 EXECUTION:
  - 3.1 Temporary Wiring Modifications shall be made in order that the lighting system shall remain in operating condition during normal lighting periods, except for the control unit being repaired or replaced.
  - 3.2 Photocontrol, Timers, and Electronic Control Units shall be inspected for proper operation and repaired or replaced as required.
  - 3.3 Safety: Contractor shall comply with applicable provisions of the National Electric Code and OSHA.

END OF SECTION 16524



## SECTION 16535

### INTERIOR SWITCHGEAR, LOW-VOLTAGE

#### PART I - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and Conditions of the Contract, including the General Conditions and Supplementary Conditions apply to the work of this Section.

##### 1.2 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by the basic designation only.
  - 1. Federal Specification (Fed. Spec.):
    - W-C-375B            Circuit Breakers, Molded Case; Branch Circuit and Service
  - 2. American National Standards institute (ANSI) Publications:
    - C2 - 84            National Electrical Safety Code
    - C 12.1 - 82        Code for Electricity Metering
    - C37.13-81        Low-Voltage AC Power Circuit Breakers Used in Enclosures
    - C37.20-69        Switchgear Assemblies including Metal Enclosures Bus (1974 Consolidate Edited)
    - C39.1-81        Requirements for Electrical Analog indicating Instructions
    - C39.2-64        Direct-Acting Electrical Recording (R69) Instruments (Switchboard and Portable Types)
    - C57.13-78        Requirements for instrument Transformers
    - ZSS.1-67        Gray Finishes for industrial Apparatus and Equipment
  - 3. American Society for Testing and Materials (ASTM) Publications:
    - A123-84        Zinc (Hot-Dip Galvanized) Coatings on iron and Steel Products
    - A153-84        Zinc Coating (Hot-Dip) on Iron and Steel Hardware
    - A525-83        General Requirements for Steel, Zinc-Coated (Galvanized) by the Hot-Dip Process
    - A780-80        Repair of Damaged Hot Drip Galvanized Coatings.
  - 4. American Water Works Association (AWWA) Publication:
    - C203-78        Coal-Tar Protective Coatings and Linings for Steel Water Pipelines - Enamel and Tape Hot -Applied





5. Construction Specification Institute (CSI) Publications:  
CSI Specification Data - Stainless Steel (February 1976)
6. National Electrical Manufacturers Association (NEMA) Publications:  
ICS 6-83 Enclosures for Industrial Controls and Systems  
LI 1-83 Industrial Laminated Thermosetting Products  
PB 2-84 Deadfront Distribution Switchboards  
PB 2.1-79 Instructions for Safe Handling, Installation, Operation, and Maintenance of Deadfront Distribution Switchboards Rated 600 Volts or less
7. National Fire Protection Association (NFPA) Publication:  
70 -90 National Electrical Code  
70B-83 Electrical Equipment Maintenance
8. Underwriters Laboratories inc. (UL) Publications:  
467-84 Grounding and Bonding Equipment  
489-80 Molded-Case Circuit Breakers and Circuit - (R Oct 84) Breaker Enclosures  
506-79 Special Transformers (R Sep 84)

### 1.3 QUALITY ASSURANCE

- A. GENERAL REQUIREMENTS: Section 16010, "Electrical General Provisions," applies to this Section, with the additions and modifications specified herein. Equipment, materials, installations, and workmanship shall be in accordance with the required and advisory provisions of NFPA 70.

### 1.4 SUBMITTALS

- A. Manufacturer's Data:
  1. Switchboard
  2. Circuit breakers
- B. Shop Drawings: Furnish drawings for switchgear and switchboard including, but not limited to the following:
  1. Overall dimensions and front view,
  2. Ampere ratings of bus bars,
  3. Maximum short circuit bracing,
  4. Circuit breaker type, interrupting rating, trip setting,
  5. Provision for future extension,



## 16000 - Electrical

6. Elementary diagrams and wiring diagrams with terminals identified, and indicating prewired interconnections between items of equipment and the interconnection between the items,
7. One-line diagram.

### PART 2 - PRODUCT

#### 2.1 GENERAL

- A. Switchboards: NEMA PB 1, deadfront, self-supported type. Main bus shall be rated 4000 amperes at 208 volts and shall have a UL integrated equipment rating of 150,000 rms. amperes. Switchboard shall be UL listed as service entrance equipment. Devices shall be front accessible and shall be completely insulated between sections by vertical steel barriers. Align front and rear sections of switchboard. Provide switchboard in NEMA ICS 6 Type I enclosure. Switchboard shall be factory engineered and assembled, including protective devices and equipment indicated with necessary interconnections, instrumentations, and control wiring. Switchboard shall consist of main, and distribution sections.
  1. Bus Bars: Copper with silver-plate contact surfaces. Plating shall be a minimum of 0.0002 inches thick. Make bus connections and joint with hardened steel bolts. A full-capacity bus shall connect sections together, with provisions for future expansion. Buses shall be insulated from the devices so that the only exposed energized parts will be at the point of connection to devices. Locate each bus horizontally in the rear of each section behind the components and vertically centered.

Support and brace the buses for the short circuit current specified. Provide and secure ground bus to each vertical switchboard section and extend ground bus to the entire length of the structure. Size neutral bus 100 percent of full load amperes.
- B. Main Protective Device:
  1. Bolted Pressure Switch: Electrically operated switch rated 4000 amperes, and 208 volts having a short circuit rating of 200,000 rms. amperes symmetrical.
- C. Distribution Section: Provide group mounted devices arranged to allow removable and interchanging from the form of the switchboard without disturbing adjacent devices. Where indicated, "space for future" or "space" shall mean to include bus, device supports, and connections.
  1. Feeder Breakers: Molded-case type unless indicated otherwise, of sizes and capacity indicated.
- D. Finish: ANSI Z55. 1, ANSI 61 or ANSI 49 light gray, for exterior surfaces of switchboard assembly.
- E. Insulated Phase Barriers: NEMA LI 1, Type GP0-3, 0.25-inch minimum thickness. Vertical buses shall be phased isolated and insulated from themselves and the main buses.
- F. Corrosion Protection: Bases, frames, and channels of switchgear and switchboards which come in contact with concrete shall be corrosion resistant and shall be fabricated of hot-dip galvanized steel.



1. Galvanized Steel: ASTM A123, ASTM A525 G90 coating, and ASTM A153, as applicable. Galvanized after fabrication where practicable. Galvanizing repair paint shall conform to Mil. Spec. DOD-P-21035.
- G. Terminal Boards: Provide with engraved plastic terminal strips and screw type terminals for external wiring between components and for internal wiring between removable assemblies. Terminal boards associated with current transformers shall be short-circuiting type. Terminal board identification shall be identical in similar units. External wiring shall be color coded consistently for similar terminal boards.
- H. Wire Marking: Mark control and metering conductors at each end. Provide factory-installed white plastic tubing heat stamped with black block type letters on factory-installed wiring. On field-installed wiring, provide white preprinted polyvinyl chloride (PVC) sleeves, heat stamped with black block type letters. Each sleeve shall contain a single letter or number, shall be elliptically shaped to securely grip the wire, and shall be keyed in such a manner to ensure alignment with adjacent sleeves. Provide specific wire markings using the appropriate combination of individual sleeves. Each wire marker shall indicate the device or equipment, including specific terminal number to which the remote end of the wire is attached.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Electrical installations shall conform to ANSI C2, NFPA 70, and to the requirements specified herein. Provide new equipment and materials, unless indicated or specified otherwise.

#### 3.2 GROUNDING

- A. NFPA 70 and ANSI C2, except that grounds and grounding shall have a resistance to solid earth ground not exceeding 25 ohms.
- B. Grounding Electrodes: Where practicable, use electrically continuous metallic buried water piping for grounding electrode, supplemented by driven ground rods as specified.
- C. Grounding: Provide bare copper cable not smaller than No. 4/0 AWG not less than 24 inches below grade connecting to the indicated ground rods.
- D. Connections: The welding process shall not cause joined parts to be damaged or weakened and shall join strands. The welding process shall be an exothermic type, and the completed connection or joint shall be equal or larger in size than the conductors joined.
- E. Grounding and Bonding Equipment: UL 467, except as indicated or specified otherwise.

#### 3.3 INSTALLATION OF EQUIPMENT AND ASSEMBLIES

- A. Install and connect switchboards as indicated on project drawings, the approved shop drawings, and as specified herein.
- B. Switchboard: NEMA PB I
- C. Meters and instrument Transformers: ANSI C12.1



## 16000 - Electrical

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- D. Galvanizing Repair: ASTM A780, using galvanizing repair paint for galvanizing damaged by handling, transporting, cutting, welding, or bolting. Do not heat surfaces that repair paint has been applied to.

### 3.4 FIELD TESTS AND INSPECTIONS

- A. Performance of Acceptance Checks, Settings, and Tests: Perform in accordance with the manufacturer's recommendations, NFPA 70B, and referenced ANSI standards. Perform tests to obtain information about the performance of the breakers, meters, wiring, and instrument transformers together as a unit, as well as separately. Tests shall include but not be limited to the following:
1. Compare actual connections with wiring diagrams. If differences are found determine if error is in diagram or in actual wiring; correct as necessary.
  2. Inspect devices and equipment for damage or maladjustment caused by shipment or installation.
  3. Use calibrated torque wrench to assure that tightness of bolted bus joints are in accordance with manufacturer's recommendations.
  4. Perform mechanical operator and contact alignment tests on breakers and operating mechanisms in accordance with manufacturer's recommendations. Adjust as necessary.
  5. Measure breaker contact resistance and perform minimum pickup voltage tests on trip and closing coils. Adjust as necessary to stay within manufacturer's acceptable range.
  6. Check electrical continuity of current, potential, and control circuits in accordance with wiring diagrams.
  7. Perform installation resistance tests at 500 volts do on field-installed control wiring. Disconnect field-installed control wiring from equipment and from factory-installed control wiring before testing. Minimum installed resistance shall be 1,000,000 ohms.
  8. Verify type, range, and connections of instrument transformers. Confirm correct polarity of current transformers electrically.
  9. Remove short-circuiting links from current transformers after checking that secondary circuits as complete.
  10. Verify meter connections and ensure calibration.
  11. Remove wedges, ties, and blocks installed by the manufacturer to prevent damage during shipment.
  12. Verify maximum resistance to ground of ground systems.

END OF SECTION 16535



## SECTION 16570

### POLES FOR STREET AND AREA LIGHTING SYSTEMS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for poles for street and area lighting systems. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
  - 2.1 Wood Poles: ANSI 05.1 and shall be preservative-treated.
  - 2.2 Steel, Aluminum, and Concrete Poles: Wind load of 125 MPH + 1.3 gust factor shall not result in damage or misalignment of any fixtures attached. NEMA SH5.
  - 2.3 Steel Poles:
    - 2.3.1 Structural Steel: ASTM A 36.
    - 2.3.2 Zinc Coating: ASTM A 123.
    - 2.3.3 Poles shall be chemically cleaned after fabrication and shall be hot-dipped galvanized in compliance with ASTM A 123.
  - 2.4 Aluminum Poles shall be of high-strength aluminum having a yield strength of 34,000 psi.
  - 2.5 Concrete Poles: Prestressed steel reinforced, cast type in compliance with ACI 318 and 437. Cement shall comply with ASTM C 150.
  - 2.6 Painting: Materials shall match that of existing or adjacent pole finish or be as directed by the Contracting Officer.
  - 2.7 Hardware: shall be 304 stainless steel
- 3.0 EXECUTION:
  - 3.1 Safety Precautions shall comply with applicable requirements of the National Electrical Safety Code.
  - 3.2 Wood Pole Setting: In normal firm ground, minimum pole setting depths shall be as follows: for pole lengths of 20 feet, 25 feet, 30 feet, and 35 feet the minimum depth shall be 5 feet, 5 feet 6 inches, 5 feet 6 inches, and 6 feet, respectively. For pole lengths up to 100 feet the minimum depth shall be 10 percent of length for both straight and curved lines, plus 2 feet for straight lines and 10 percent of length plus 2 feet 6 inches for curves and corners. In rocky or swampy ground, pole setting depths shall be respectively decreased or increased as required by local power company published standards and as approved by the Contracting Officer. In swampy ground, a bog shoe may be used.
  - 3.3 Wood Pole Inspections:
    - 3.3.1 Visually Inspect Standing Wood Poles for ground-line heart rot, above ground heart rot, pole top heart rot, shell rot, mechanical damage, eroded foundations, large splits, and lightning damage.



## 16000 - Electrical

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- 3.3.2 Coat Surfaces with creosote-base wood preservative coating compound and wrap with impregnated felt bandage in compliance with wood pole preservative materials supplier's instructions.
- 3.4 Wood Pole Decay Maintenance:
  - 3.4.1 Ground-Line Heart Rot shall be treated with an approved fumigant.
  - 3.4.2 Wood Poles with surface decay below grade shall be replaced with new poles.
- 3.5 Concrete Repair: Repair spalling in pole foundations and concrete poles by thoroughly coating with 2,000 psi shear strength epoxy resin, applying 3,000 psi 28-day concrete, and finishing to restore original configuration of the concrete.
- 3.6 Steel Pole Maintenance: Steel poles that are corroded shall be chemically cleaned of rust and scale and painted.

END OF SECTION 16570



## SECTION 16590

### SPECIAL LIGHTING

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of luminaries. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Lamps shall be the standard product of Chapion Lamp Co., General Electric Lamp Co., Sylvania Electric Co., Westinghouse Lamp Co. Incandescent, fluorescent, color corrected mercury vapor, metal halide and high pressure sodium lamps for all fixtures shall be furnished and installed by this Contractor.
- A. Incandescent Lamps shall be inside frosted. Lamps of 200 watt size or smaller shall be of the medium base type. Fixtures equipped with 300 watt lamps may be of the medium or mogul base types, unless otherwise noted. Lamp sizes of 500 watts or larger shall be equipped with mogul bases.
- B. Fluorescent Lamps for rapid start and trigger start shall be T-12, Warm white, 425 ma., medium bi-pin. Three foot and four foot rapid start lamps shall be the 25 watt or 25 watt energy conservation lamp
- Slimline lamps shall be T-12, warm white, 425ma single pin. Four foot and eight foot slimline lamps shall be the 30 watt and 60 watt energy conservation lamp.
- C. Mercury Vapor or Metal Hallide Lamps shall be the Saft-T-Vapor lamp type similar to Dur-O-Test, Luxor and Westinghouse safety life guard mercury lamps, are designed to conform to the "American National Standard Institute", Standard entitled: ANSI C78,1330-1976, Specification for Mercury Lamps with Integral Means for Extinguishing the Arc after the Outer Envelope is broken.
- 2.2 Description of Fixtures:
- 2.2.1 Incandescent Fixtures:
- Type A: Boiler gauge fixture consist of two adjustable pipes, not less than 3/8" inside diameter and 18" long, a porcelain enamel; steel angle reflector , a pipe clamp for mounting, a swivel clamp for adjusting , and a socket. Provide two-conductor flexible cord of sufficient length to reach outlet box in boiler room ceiling. Fixture the equal of Simes Company 43780, Mcphilben Company 77/3107 or Beaux Arts No. A-1000 will be acceptable.
- Type B: Surface mounted fixture consist of a shallow bowl porcelain enamel steel reflector, reflector holder and a medium base lamp receptacle. Reflector, holder shall be of 20 gauge spun brass or 16 gauge spun aluminum or polished cast aluminum, finish to be as selected.



## 16000 - Electrical

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Holder shall be approximately 6" diameter. Fixture the equal of Simes 43816, Mcphilben Company 77/1317 or Beaux Arts 1141 will be acceptable.

Type C: Pendant fixture consist of a canopy, swivel connector , stem, reflector husk, medium base socket and a porcelain enameled steel reflector. Canopy and husk shall be of 20 gauge brass or 16 gauge aluminum. Husk rim shall be for 2 1/4" reflectors. Fixture the approved equal of Simes Co. 47823 or McPhilben Co. 77/1276 will be acceptable.

### 2.2.2 Protected Type Fixture:

Type D: Each fixture shall have a cast aluminum base and fixture body, porcelain receptacle, screw-on type glove with rubber gasket, and a heavy round half hard cast aluminum guard and gasket. Each fixture shall be of sufficient size to accommodate a 100 watt lamp.

Each protected type fixture shall be fastened firmly and securely to a special four hole outlet box by means of four (4)brass or monel metal machine screws. Bracket type protected type fixtures shall be provided with SQUARE outlet boxes; round or octagonal outlet boxes will not be acceptable. Each protected type fixture shall be provided with a rubber gasket between box and the fixture. Fixtures shall be the equal of Russell and Stoll, Simes or Appleton.

Type D1: This fixture shall have 1/2 inch cadmium plated pipe stems, and shall be equipped with approved swivel aligners the equal of Benjamin No. 3369. Fixture shall be supported by means of a hickey, or an approved strap, or FOUR threaded screws form a special box with FOUR threaded holes. Submit sample of fixture and box with method of mounting.

Type D2: Fixtures shall be the equal of Russel and Stoll No. 6369A for 100 watt, and No. 6104A for 150/200 watts.

Same fixture as described above, with the exception the lamp wattage size shall be 150-200 watts.

### 2.2.3 Vaportight Fixtures--Ceiling Type

Type E: Fixture shall be the equal of Russell and Stoll, Catalog #6330A or approved equal. Lamp wattage shall be 100 watts.

Type E1: Same as above with exception lamp wattage size is 150-200 watts.

Keyless Lampholders (Keyless Receptacles):

Type E2: Pull Chain Lampholders (Pull Chain Receptacles):

Pull Chain Lampholders (Pull Chain Receptacles) shall be of the porcelain type similar to Hubbel No. 830; Pass and Seymour No. AL-848; Bryant No. 4275, or approved equal..

### 2.2.4 Drop Cord Pendants:

Type F: Drop Cord Pendants shall consist of No. 18 Type "SJO" flexible cord passing through a cord grip the equal of Arrow-Hat No. 112, Appleton No. 8441, Hubbell No. 112 or equal, in cover of outlet boxes, and medium brace pull chain or key sockets. Sockets shall hang 6'-6" from floor to bottom of sockets.





Threaded catch type sockets shall have a 250 watt rating and equipped with cord grip caps. Sockets shall be held to the cap by two (2) screws. Sockets shall be Hubbell (Body No. 3984--Cap NO.3983), Bryant (Body No. 4710--CP No.LG), Arrow-Hart (Body No. PA--Cap No. 962), S.E.9 (Body No. GE 2703--CapNo. GE2794), or Pass and Seymour (Body No. 0-26--Cap No. 0-PY).

Cone Reflectors: Drop cord pendants shall be equipped with 8 inch diameter deep cone reflector at specific locations as indicated.

Type F1: This type is similar to above with the exception that it terminate in a Hubbell #5374 connector body with a "U" shaped ground.

Furnish a Type "SJO" flexible cord with three, number 18 conductors for this type.

Type F2: Cast aluminum wall bracket, for wattage indicated, tapered opal glass globe, threaded neck and gasket with guard, stain aluminum finish and anodized for outside building the equal of McPhilben 43-line or Simes. Fixture shall be vaportight.

Type F3: Similar to fixture above, exception that fixture shall be furnished with a guard.

Type F4: Cast aluminum, satin anodized ceiling unit. Unit shall be cylinder-shaped, approximately ten inches high with an open baffle and an R-40, 300 watt flood lamp or 150 watt spot lamp. Fixture shall be the equal of McPhilben 3-line.

Type F5: Shallow Square Recessed Ceiling Unit. Cast aluminum concealed hinged face plate with "A" Flat glass or lens, "B" Square lensed bowl, "C" Square opal bowl as indicated for lamp size selected No 1. 18 gauge treated steel or aluminum housing baked white enamel interior with spun aluminum reflector. For concrete pour, housing shall be No. 16 gauge hot dipped galvanized steel. Porcelain socket on removable wire-way. Frame shall be held by self centering captive screw and finished satin aluminum and anodized if installed outside. Fixture the equal of McPhilben 68-line , or Simes 44785 will be accepted.

Type F6: A surface mounted cylindrical downlite with a 8 1/2" clear alzak aluminum reflector.

Lamp shall be 75 watt, R-30 medium base, or Housing shall be precision formed 14 gauge aluminum.

Wire shall be #14 AWG fixture wire.

Finish of fixture shall be baked semi-matte white.

Fixture shall be Omega Lighting, Catalog #SC-397 or approved equal.

Fixture shall be furnished with wire guard mounted on ceiling.

Fixture furnished with spotlight or floodlight type of lamps shall be noted.

Type F7: Furnish and install, as directed, in dark room a pendant type safelight . Furnish canopy with bushed hole. Canopy shall include hardware to hold chains which support safelight and shall be attached to outlet box. A three conductor flexible cord shall be directly connected to outlet box and supported by a cord grip. Connect a three (3) conductor grounding plug to the other end of the cord.



## 16000 - Electrical

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Safelight receptacle shall be replaced by three conductor plug and safelight housing shall be connected to ground prong of receptacle. Safelight shall be the equal of Kodak Utility Safelight Lamp Model (C) with Series OA filter and 15 watt bulb.

Type F8: A surface mounted, vandalproof, 100 watt lamp lighting fixture diffuser shall be mold clear lexan with inner and outer prisms. Diffuser is fastened to chasis with one tamperproof screw. Chasis is constructed of 14 gauge steel with four mounting screw. Fixture shall be Tork, Catalog #6530 or approved equal.

Type F9: A surface mounted incandescent lighting fixture with guard. Fixture shall be completely enclosed and gasketed for weather-tight and vapor tight applications. Backplated shall be precision cast aluminum with two hinge hooks for support of pin hinges. Finish shall be matte aluminum. Hinged trim shall be rugged precision aluminum, high tensile strength alloy, corrosion resistant, minimum wall thickness 1/8 inch. trim is hinged to backplate. Finish shall be satin aluminum Reflector shall be semi-spectalar, anodized aluminum. Light control shall be a prismatic refractor. Protective guard and trim is one piece casting. Fixture shall be furnished with 2-100 watt lamp. Fixture shall be furnished with finishing collar P-1679 when used in Modernization work.

Type F10: A recessed flush step light. Cast aluminum, louvre frame with not less than 16 gauge steel housing with porcelain angle sockets for 2-25 watt lamps wired for separate circuits. Fixture shall be Simes, Catalog number 43971 or approved equal.

Type F11: A surface mounted indoor emergency lighting fixture with a Par 36, 25 watt lamp for a 12 volt system. Housing shall be constructed of with torsion spring frame. Trim shall be completely gasketed and lamp shall be able to be adjusted in two planes to 45 degrees. Fixture shall be 8 3/4 inches in diameter and 4 inches deep. Finish shall be white enamel. Fixture shall be Light alarms Electronics Corp., Catalog #ELF606 or approved equal.

Type F12: Shall be similar to above but furnished and installed with a guard.

### 2.2.5 Exit Light Fixtures:

Type G: Surface mounted, single faced exit sign. Housing shall consist of aluminum or treated steel. Access door shall be suitably hinged at top and shall contain 3/16" phosphorescent glass panel, with white background, having red letters, 8" high (unless otherwise indicated) etched on panel. Provide directional arrow, one way arrow, two way arrow or no arrow as called for on drawings. Fixtures shall have two, 8 watt T-5 fluorescent lamps. Provide suitable guard when directed shall be satin aluminum. Fixtures the equal of McPhilben 40 line, Simes, Gruber or Garco will be acceptable.

### 2.2.6 Fluorescent Fixtures:

Type H: Acceptable fixtures are McPhilben Mfg. Company No. 18-17 (without glass); Gotham Lighting Corporation No. 2202 (without glass); Simes Company No. 43173; Beaus Arts No. Q1615, or approved equal conforming to this specification.

Type H: A 20 inch long, two tube, wall mounted fluorescent lighting fixture. Housing shall be heavy gauge aluminum, with stain aluminum finish. Diffuser shall be extruded, ribbed, white acrylic. Fixture shall contain a convenience outlet. Lamps shall be 15 watts each, T-8 type.



Pull chain shall be furnished where inducted. Fixture shall be McPhilben, Catalog #37-66ATHPF or approved equal.

Type H1: A two tube, four foot long fluorescent fixture. Lamps are 34 watt energy conservation low loss type. Housing, end plates and ballast cover are die formed of 20 gauge, cold rolled steel. Diffuser is high transmission acrylic, of the snap in type. Finish shall be baked white enamel. Fixture shall be Neo-Ray, Catalog # 3367W or an approved equal.

Type H2: Furnish and install, at a location indicated, a low energy 19 watt circline vandalproof, fluorescent lighting element. Lens shall be retained by one tamperproof screw and integral tabs. Housing shall be die formed 14 gauge steel, finished in baked white enamel. Power shall be for 120 volt AC. Fixture shall be similar to LIGHTRON, catalog #VPF-88-19C or approved equal.

Type H3: The fixture shall be the equal of Kent-Eastern 367S, McPhilben, or Neo-Ray.

Type H4: Fixtures shall be the approved equal of Continental Lighting Products, No. 8100-340RS (4 ft.) No. 8100-6408T (8 ft.) McPhilben Lighting, Keene Lighting Corp.

Type H5: Surface mounted fixture of a generally rectangular shape with a wrap around diffuser. This fixture shall be similar to the type above, except that this fixture shall be surface mounted. Fixtures shall be the approved equal of Continental Lighting Products No. 8100-340RS (4 ft.) No. 8100-6408T (8 ft.), McPhilben Lighting, Keene Lighting Corp.

Type H6: Furnish and install, at location shown on drawing a four foot, single tube (34 watt rapid start lamp) with a clear acrylic, one piece refractor. Fixture shall be for surface or pendant mounting. Finish shall be baked white enamel. Housing shall be 20 gauge die formed steel. Fixture shall be similar to Miller Co., Catalog #DA-1101-04 or approved equal.

Type H7: Acceptable fixtures are McPhilben No. 77/3110; Simes No. 43827; or an approved equal.

Type H8: Edge Lite Ceiling Exit Signs. Cast aluminum construction hinged access door invisible glass fasteners. Inscription panel 3/16" phosphorescent glass with carved 6" red letters separated by white metal divider. Signs shall be single or double faced, no arrow, one way arrow to two way arrow as noted for two, 8 watt, T-5 fluor. lamps and finished satin aluminum. Signs shall be McPhilben 45 series, or Simes 45241. Fluorescent Light Strip (with reflector). For continuous or individual units of 18-24-36 and 48 inch length with end plates and couplings as required. Heavy gauge treated steel channels and covers.. Furnish complete with asymmetric type reflector unless otherwise noted. Finish baked white enamel of high reflectivity and durability.

Type H9: Recessed exit sign consisting of an 18 gauge galvanized steel back box having cast aluminum fixed trim and hinged door with non-rusting hinge pin. Exit panel shall have the word "Exit" in 8" high letters on a white opal phosphorescent glass background. Fixture shall have two, 8 watt, T-5 fluorescent lamps. Finish of fixture to be as selected. Similar to above, except without reflector.

Diffuser shall be prismatic virgin acrylic. Finish to be baked white enamel. McPhilen 18-12 line or equal will be acceptable.

#### 2.2.7 High Pressure Sodium:



## 16000 - Electrical

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Type I: Fixture shall be a 11 inch x 11 inch square with a 70 watt high pressure sodium lamp. Diffuser shall be a clear prismatic polycarbonate type. Fixture shall be supplied with tamperproof screws. Fixture shall be McPhilben, Catalog # 22B3162JB or approved equal.

Type I1: A wall mounted luminaire consisting of a contoured, anodized aluminum a symmetric reflector, molded prismatic thermal shock-resistant glass refractor, integral hid ballast housed within a weatherproof, die cast aluminum housing. The unit shall have a hidden cast aluminum pressure latch to open and close the hinged door. There shall be a safety chain attached between the housing and door. Fixture shall be 14 1/4 inches long by 6 7/16 inches in depth. Fixture shall be furnished with a cast aluminum guard. Fixture shall have a bronze finish. The integral ballast shall operate a 70 watt HPS Lamp. Fixture shall have tamperproof hardware. Fixture shall be Johns Manville, Catalog # 419-120-0108-TP-BZS or an approved equal.

Type I2: Fixture shall be a stem mounted high pressure sodium lamp unit furnished complete with a 150 watt high pressure sodium lamp. Unit shall consist of a self contained high power factor constant wattage ballast completely wired with reflector and guard.

Type I3: A surface mounted high pressure sodium fixture furnished with a 150 watt high pressure sodium lamp, approved guard with center opening for relamping. Unit shall consist of a self contained high power factor constant wattage ballast completely wired with approved reflector and guard. Ballast shall be remote of fixture.

Housing shall be cast aluminum or 14 gauge galvanized steel plate with Ellipsoidal semi specular aluminum or prismatic glass reflector.

Fixture shall be Abolite Ltg. Inc., Holophane or Wide LT. Corp. or approved equal.

Type I4: Same as above, with the exception that the integral ballast shall operate a 250 watt HPS lamp.

Type I5: This fixture shall contain a 400 watt high pressure sodium lamp with an Alzak Aluminum reflector and heat and impact resistant glass. Fixture features a die cast aluminum housing and integral slipfitter. All hardware is stainless steel.

Fixture shall have a vandal resistant shield. Ballast shall be a hinged and readily removable ballast assembly. Fixture shall be Crouse Hicds, Catalog # MVF-4LEC-120 VS or approved equal. Finish shall be dark bronze thermo set acrylic enamel.

Type I6: Same as above with exception that the ballast shall operate a 1000 watt high pressure sodium (HPS) lamp.

Type I7: This fixture shall be a high pressure sodium lighting fixture with a shallow symmetric prismatic G-6477 . Lamp shall be as indicated. Fixture shall be constructed of cast aluminum with integral ballast compartment. Fully enclosed and gasketed, suitable for wet locations. Housing shall be cast aluminum, 3/16 inch wall thickness of corrosion resistant alloy. Finish shall be satin aluminum. Reflector shall be die formed specular alzak.

Face plate shall be cast aluminum provided with drop hinges, gasketed to housing and secured with two Philips head captive screws, satin aluminum anodized finish. Furnish faceplate with guard. Ballast shall be constant wattage, high power factor, 180 C. Class "N"



auto transformer type, standard 120 volt primary. Fixture shall be for ceiling mounting. Fixture shall be McPhilben, Catalog #15B-170 or approved equal.

2.2.8 Emergency Lighting Systems:

General : Furnish and install as hereinafter indicated one of the following systems:

- A. Emergency Battery Units - (6 volt or 12 volt)
- B. 115 Volt Emergency Lighting System (Battery powered and charged emergency lighting system)

115 Volt Battery Powered and Charged Emergency Lighting System

A. General:

This Contractor shall furnish and install a 115 volt, battery powered and charged emergency light system, when indicated, the approved equal of Light alarms Model # CS115NC Series will be acceptable.

END OF SECTION 16590



## SECTION 16595a

### BALLASTS AND TRANSFORMERS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of luminaire ballasts and transformers. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
- 2.1 Constant-Current Transformers shall be of the automatic, moving-coil types designed to maintain the secondary current within 1 percent of rating when operating under normal loading conditions. A protective relay that will automatically disconnect the transformer from the line on the open series circuit shall be provided as an integral component of the transformer. Transformers shall be rated 10kW, 2,400 volts, 60 hertz primary and 6.6 amperes secondary.
- 2.2 Fluorescent Ballasts shall be high-power factor type, Class P rated, and CBM certified rated for single or two-lamp operation. Ballasts shall be lead type for minimum starting temperature of plus 50° F.
- 2.3 High-Intensity Discharge Ballasts shall be high-power factor, single lamp type. Ballasts shall be Type 2, weatherproof for outdoor use.
- 2.4 Lamp Ballasts: ANSI C82.1, C82.4, UL 935, and UL 1029 as applicable.
- 2.5 Transformers, Regulators, and Reactors shall be in compliance with the requirements of NEMA TR-I,
- 3.0 EXECUTION: Contractor shall comply with provisions of the National Electric Code.
- 3.1 Maintenance and Repair of Regulators shall include cleaning or replacement of dirty or burned contacts, replacement of worn or broken mechanical parts and electrical insulation, cleaning and tightening connections, replacement of leaking seals and gaskets, replacement of burnt oil, stopping of tank leaks, securing of loose or broken mounts, repair of shorted windings, and testing of regulator against varying loads and for shorts and high resistances.
- 3.2 Temporary Wiring Modifications shall be made in order that the lighting system shall remain in operating condition, except for the item being repaired or replaced, during normal lighting periods.
- 3.3 Outages: Service interruptions shall be scheduled in advance with the Contracting Officer.

END OF SECTION 16595a



## SECTION 16595b

### LUMINAIRES

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of Luminaires. Products shall match existing materials and/or shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
  - 2.1 Lamps: ANSI C78, C79
  - 2.2 Fixtures: UL 781, 844, 57, 595, 1570, 1571, 1572
  - 2.3 Lamp Bases and Holders: UL 496, 542, and ANSI C81.
  - 2.4 Ballasts: UL 935, 1029, and ANSI C82.
  - 2.5 General Electrical: NEPA 70.
  - 2.6 All Luminaires shall be designated "IES distribution type" as referred to in the IES Lighting Handbook.
    - 2.6.1 Luminaires shall be adjusted to achieve lighting levels and patterns specific to the application as recommended by the manufacturer. Each luminaire shall bear the UL label.
    - 2.6.2 Only the Luminaire Being Repaired or Replaced shall be disconnected from its source of supply during the normal operating hours of the lighting system.
    - 2.6.3 Luminaire Heads or Housings shall be die-cast aluminum with slip-fitter mounting and provided with 1-1/4 inch through 2-inch slip-fitter fittings. Luminaire heads shall have standard dimensions for interchangeable standard optical assemblies. Heads shall be internally wired and rated at 600 volts.
    - 2.6.4 Enclosed Luminaire shall consist of an Alzak-finished aluminum reflector and enclosing refractor mounted on a standard luminaire head.
    - 2.6.5 Open Luminaires shall consist of an Alzak-finished aluminum reflector with shielding reflector on house side providing IES Type I distribution, mounted on a standard luminaire head.
  - 2.7 Incandescent Luminaires:
    - 2.7.1 Luminaires Shall Be Enclosed Type for filament lamps with IES Type I distribution and shall have a glass refractor providing IES Type I distribution.
    - 2.7.2 Floodlights Shall Be Enclosed Type with adjustable support brackets. Enclosed floodlights shall be Class HD having a beam spread of 10 to 18 degrees. Open type floodlights shall have a beam spread of 70 to 100 degrees.
  - 2.8 Fluorescent Luminaires shall be the enclosed type.



## 16000 - Electrical

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- 2.9 High Intensity Discharge Luminaires shall be enclosed type for HID lamps with IES Type I distribution. Enclosed Luminaires shall have an enclosing glass refractor providing IES Type I distribution.
- 3.0 EXECUTION:
- 3.1 Protection: Take precaution in accordance with ANSI C2.
- 3.2 All Service Interruptions shall be scheduled in advance with the Contracting Officer.
- 3.3 Workmanship: NFPA 70 and 70B.

END OF SECTION 16595b





## SECTION 16620

### EMERGENCY LIGHTING SYSTEMS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for street and area lighting controls. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Furnished and install as hereinafter specified when indicated on drawings one of the following systems:
- A. Emergency Battery Units - (6 volt or 12 volt)
  - B. 115 Volt Emergency Lighting System (Battery powered and charged emergency lighting system)
- The emergency lighting systems, noted above, shall be interconnected with certain units of the exit light system as indicated.
- All equipment shall be the product of one manufacturer. All units of the system shall be arranged for permanent conduit connections.
- 2.2 Emergency Battery Units: Shall consist of a 40-ampere hour (5.5-6.0 volt) nickel cadmium battery, specifically designed for emergency lighting purposes. Unit shall contain a rectifier for constant trickle charge and an automatic device to provide up to 12 hours of fully automatic fast charge. Fast charge shall be sufficient to return battery from full discharged to full charge in 12 hours time. Provide push button switch and a red neon pilot light to indicate the unit is ready for operation and properly functioning. Complete unit shall be housed in a compact case with hinged cover. Case shall have a corrosion resistant undercoat and an oven baked gray hammerstone finish.
- Unit shall be approved by and bear the label of Underwriter's Laboratory and shall be Lightalarms Model OSN6, by Nicad (Nickel Cadmium Corp.) or similar. Dual Lite Co., Hobby Brown Corp., Electric Cord, or Electric storage Battery Co. Model NA-40. Unit shall be mounted on a 14-gauge steel mounting platform finished to match unit.
- 2.3 Emergency Light Units: Where indicated shall be flush mounted universal swivel, 25-watt, 5-inch sealed beam floodlight with satin aluminum or satin chrome finished trim plate. These units shall be Light alarms Model ELF605 or equal. Surface mounted units shall be Model ELF606 or equal. Where these units are installed in Gymnasium they shall be equipped with wire guard.
- 2.4 Spares: Deliver to the Contracting Officer 100 percent spare sealed beam units.
- 2.5 115 Volt Battery Powered and Charged Emergency Lighting System:
- A. General: This Contractor shall furnish and install a 115 volt, battery powered and charged emergency light system, when indicated, Light alarms Model #CS115NC Series or approved equal will be acceptable.



## 16000 - Electrical

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### B. Battery and Charger Control Panel:

- 2.6 Cabinet: This panel shall be in a cabinet, floor mounted, 18 gauge steel with undercoat finished in baked hammertone gray. The cabinet shall contain a 95 cell, 115 color nickel cadmium battery, charging equipment, meters, etc. and shall be adequately ventilated.
- 2.7 Charger: Charging shall be fully automatic 2-rate accomplished via a 100% solid state circuit having no relays of other moving parts. The high charge shall be initiated when the battery supply has been lost. Charge shall continue until the battery reaches a voltage of 142.5 volts. The entire charger shall be current limited such that a float or trickle charge condition holding the battery at 122 volts. At that time the charger shall revert to the difference between the high-charge-current on a fully discharged and a fully charged battery does not vary more than 1 ampere. Current limiting shall also protect the charger in the event of a short circuit condition. The high charge shall be capable of recharging a discharged battery from 104.5 volts to 142.5 volts, within 12 hours.
- 2.8 Battery: Nickel cadmium battery shall be 95 cells and rated for 115 volt operation, and supplied with translucent plastic cells for viewing the electrolyte level. Electrolyte capacity is sufficient to provide a period of from 3 to 4 years without servicing. Battery shall be of sufficient capacity to carry the total load for 90 minutes to an end voltage of 1.1 volts per cell.
- 2.9 Transfer Panel: This panel shall provide instant emergency lighting in the event of a failure in normal service by automatically transferring to battery operated power. Panel shall consist of hermetically sealed mercury relays, operational relays, pilot light and test button. These components shall be mounted in a surface mounted cabinet, 20 gauge steel, with a corrosion resistant undercoat and baked gray hammertone finish with hinged door and snap catch. Hermetically sealed mercury relays shall be 150 ampere.
- 2.10 Emergency D.C. Circuit Breaker Panel: This panel shall be mounted in a surface mounted, 18 gauge steel cabinet finished in baked gray hammertone. Provide a hinged door with snap catch over breakers. A phenolic back plate shall contain terminals, buzzer, pilot light silencing switch and circuit breaker connections. The number of circuits will be as indicated. The tripping of a circuit breaker will energize a buzzer and pilot light. Silencing switch "Off" position silences buzzer. When the breaker is reset, the buzzer will sound until the silencing switch is moved back to the "On" position. The approved equal of Light alarm CBAP Series will be acceptable.
- 2.11 Battery Alarm Panel: This panel shall be mounted in a code gauge steel cabinet with a hinged door and an approved lock. Panel shall consist of a volt-meter, buzzers, relays, pilot lights and switches. Panel sounds and alarm on failure of battery or 120 AC alarm supply, battery voltage drops, charger stops, floating charge required adjustment, load fuse opens, system is in operation, open circuit occurs, electrolyte loss. The circuiting of this panel shall be solid state. Operation of silencer switch will be similar as herein before described for circuit breaker panel. The approved equal of Light alarms XBAP Series will be acceptable.
- 2.12 Alarm Panel: Where indicated, furnish and install, a remote alarm assembly consisting of the same audible and visual alarms with silencing switches as forementioned Battery Alarm Panel. Mount this equipment in a standard flush four gang wall box with engraved .302 stainless steel plate. Unit shall be the approved equal of Light alarms Model #LSR-2.
- 2.13 AC Standby System: Furnish and install and connect an AC Standby Power System with Nickel Cadmium Battery in accordance with these specifications and as directed.



KVA rating, voltage input and voltage output shall be as indicated.

The AC Standby Power System shall have the following features unless otherwise noted :

- A. Electrolyte Level Monitor and Alarm
- B. Output Circuit Breaker
- C. Remote AC/DC Monitor Alarm
- D. Remote Electrolyte Level Monitor

All mounting hardware, cabinetry, outlet and junction boxes, metal raceway and conductors necessary to complete this installation shall be furnished, installed and connected by the Electrical Contractor. Equipment shall be all of one manufacturer. System shall be the approved equal of Light Alarms, Dual Lite, etc.

END OF SECTION 16620



## SECTION 16640

### CATHODIC PROTECTION OF STEEL WATER TANKS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials for the repair and maintenance of cathodic protection of steel water tanks. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
- 2.1 Contractor's Qualification: A qualification such as NACE accredited corrosion specialist or a Senior Corrosion Technologist is required to perform or to supervise the inspection of the cathodic protection system. The contractor making the repair and installing new equipment, materials, or components shall be under the direct supervision of a NACE accredited corrosion specialist or a Senior Corrosion Technologist.
- 2.2 Approval: All material and equipment shall be NACE approved.
- 3.0. EXECUTION:
- 3.1 Inspection: The inspection of the cathodic protection system shall be made in compliance with, applicable NACE and EPA standards. The inspection shall include a potential profile of the underground tanks and piping together with visual and electrical tests.
- 3.1.1 Tank-to-Water Potential Tests: Adjust the rectifier voltage or amperage so as to satisfy design current densities or specified voltage. Document readings, and note any reading below -0.85 volts versus the copper-copper sulfate half-cell or silver-silver chloride half-cell (using conversion chart). Successive potential readings shall be made with the tank full of water and the reference electrode placed at various depths, starting at 1 foot below the surface of the water and continuing at 3-foot intervals to the bottom of the tank. (A vertical inspection profile shall be taken along the wall between each anode string.) The tank bottom shall also be traversed equidistant from all distributed anodes. Inspect risers by placing reference electrode along the side wall of the riser and measuring at 3-foot intervals as far as possible.
- 3.1.2 Polarization of the submerged steel surfaces to a tank-to-water potential shall be at least a negative 0.85 volts.
- 3.1.3 Voltage Measurements Between Tank and Electrode: When inspecting new well-coated tanks, the voltage measured between the tank and reference electrode that is placed at any point along the coated surface shall not exceed negative 1.2 volts.
- 3.1.4 The Rectifier shall be free from any restriction that inhibits free air circulation. Keep air-cooled rectifiers free from dust accumulation, clogged filters or screens, brush, grass, or nests. Fill oil-cooled rectifiers to the proper level, and change the oil when it becomes cloudy. Dispose of oil that is removed as directed by the Contracting Officer.



- 3.1.4.1 Output Measurement: Measure and record the current and voltage output. Compare the readings obtained against the previous readings.
- 3.1.4.2 Stack Tests: Inspect the semi-conductor stacks to ensure that they are functioning properly and have not exceeded their useful life. The two quantities that shall be measured are reverse current leakage and forward voltage drop. When either of these values increase beyond limits set by the components manufacturer, replace the stack.
- 3.1.4.3 Meter Tests: Check the meters in the rectifier for accuracy by using portable instruments (voltmeter and ammeter) of known accuracy.
- 3.1.5 Visual Inspection of the water tank shall be conducted while the Contractor is inspecting the anodes and wiring. At the direction of the Contracting Officer, lower the water level to expose as much of the wiring as practical to inspect for deteriorated insulation, faulty connections, etc. Inspect the interior surface for condition of coating and apparent rust or calcareous build up. In systems using permanent anodes, determine if the anode shall last until the next inspection. Record broken, damaged, and missing anodes. Inspect wiring to the anodes. Replace wire that has deteriorated insulation.
- 3.1.6 Reference Electrodes and Connecting Wires shall be inspected by the Contractor to determine whether they are capable of operation until the next annual inspection.
- 3.1.7 Reports: Record and submit all data. Corrosion control records shall follow recommendations found in NACE RP-OI.
- 3.2 Maintenance and Repair:
  - 3.2.1 Compliance: The maintenance, repair, and installation of replacement materials shall be in compliance with accepted NACE practices. Install all materials and equipment in compliance with the recommendations of NACE or the manufacturer or comply with the Contract documents. Contractor shall replace all broken, missing, deteriorated, or otherwise unserviceable components determined during inspection.
  - 3.2.2 Workmanship: The maintenance, repair, and installation of repair materials shall be under the supervision of the Contractor's NACE Accredited Corrosion Specialist or Senior Corrosion Technologist. Installation shall be performed by personnel who are specifically trained in this work by the manufacturer and who are engaged full time in the installation and servicing of cathode protection equipment. Electrical work shall be in compliance with the requirements of the National Electrical Code.
  - 3.2.3 Testing Methods: Upon completion of repair, the Contractor shall test, adjust, and place in service the cathodic protection system by the following methods:
    - 3.2.3.1 Testing: Adjust the voltage of the rectifier so as to cause a sufficient current to flow to polarize all parts of the structure to at least -0.85 volts. With a given amount of current flowing, voltage measurement shall be made from the tank to a copper-sulfate reference electrode in contact with the water. Successive potential readings shall be made with a calibrated voltmeter, with the tank full of water and the reference electrode placed at various depths starting at 1 foot below the surface of the water and continuing at 3-foot intervals to the bottom of the tank. The tank bottom shall also be traversed and readings taken every 3 feet in a single horizontal direction. In making these tests, place the reference electrode midway between two tank anodes and suspend close to, but not touching, the side or



## 16000 - Electrical

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bottom of the tank. The distance between the reference electrode and the wall shall not exceed 1 inch for all readings. If any parts of the structure register voltages more negative than minus 1.2 volts note this in a deficiency checklist.

- 3.2.3.2 Rectifier Adjustment: Final adjustment of the rectifier output current shall be made so that repeated voltage readings taken as specified above for testing fall between the limits of minus 0.75 to minus 1.2 volts when measured against the reference electrode.
- 3.2.3.3 Signs: The Contractor shall paint or stencil his name, date of inspection of the system, and due date of next inspection at a place on site designated by the Contracting Officer.
- 3.2.3.4 Reports: After final adjustment, place the cathodic protection system in service, record the conditions of the system as left by the Contractor, and submit the report to the Contracting Officer.
- 3.3 Operating and Maintenance Instructions: The Contractor shall contribute technical data to the cathodic protection records file maintained by the Contracting Officer. These technical records shall include such items as: manufacturer's data on installed equipment, operating instructions, lists of repair parts, names and addresses of sources of parts and services, current price lists, repair and maintenance instructions, and construction specifications and shop drawings. When the system has been modified or new components have been added, the Contractor shall prepare and furnish the Contracting Officer two complete sets of typewritten or printed instructions covering the maintenance and operation of the installation. The instructions shall cover proper adjustment of the direct current flow, a brief description of cathodic protection principles, a single line operating diagram, anode consideration with reference to local conditions, trouble-shooting checklists, and any other pertinent information concerned with the proper care and maintenance of the installation.

END OF SECTION 16640



## SECTION 16641

### CATHODIC PROTECTION SYSTEM FOR UNDERGROUND UTILITIES

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of cathodic protection systems for underground utilities. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
  - 2.1 Contractor's Qualification: A qualified person, such as a NACE accredited Corrosion Specialist or a Senior Corrosion Technologist, is required to perform or supervise the inspection of the cathodic protection system. The contractors making the repair and installation of new equipment, materials, or components shall be under the direct super-vision of a NACE accredited Corrosion Specialist or a Senior Corrosion Technologist.
  - 2.2 Standard Products: Materials and equipment to be used in the repair or replacement of a cathodic protection system shall be a product of a manufacturer regularly engaged in the manufacture of the product, shall meet the NACE requirements, and shall essentially duplicate materials and equipment that have been in satisfactory use at least two years.
- 3.0 EXECUTION:
  - 3.1 Inspection: A complete inspection of the system shall be made in compliance with NACE RP-OI. All findings shall be made in the form of a written report as directed by the Contracting Officer.
    - 3.1.1 Sacrificial (Galvanic) Anode System: Inspect foreign or neighboring structures to determine if a structure is being made more positive by the cathodic protection system. When structure-to-soil (electrolyte) potentials indicate that a neighboring structure is being made more positive, bonding shall be required to avoid damage.
    - 3.1.2 Impressed Current (Rectifier Ground Bed) System:
      - 3.1.2.1 Component Inspection: Make inspection of the individual components to ensure that all parts are operating properly. The inspection shall include, but not be limited to, checking unevenness of the temperature or the stacks, hot or warm joints or contacts, arc burn paths, discolored insulators, watt-hour meter for creep, poor insulation, faulty lighting arresters, fuses, and cleanliness of the rectifier stack.
      - 3.1.2.2 Stack Tests: Inspect the semi-conductor stacks to ensure that they are functioning properly and have not exceeded their useful life. The two quantities that shall be measured are reverse current leakage and forward voltage drop. When either of these values increase beyond limits set by the components manufacturer, replace the stack.
      - 3.1.2.3 Interference Tests: Inspect foreign or neighboring structures to determine if a structure is being made more positive by the cathodic protection system. When structure-to-soil potentials indicate that a



## 16000 - Electrical

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neighboring structure is being made more positive, the Contractor must make recommendations in report to avoid damage.

3.2 Maintenance and Repair: After the installation of anodes, the Contractor shall inspect the system and reinspect it again 2 to 4 weeks later. In the event that the system, when repaired, will not provide the required protection, as evidenced by the final tests and measurements, the Contractor, together with the Contracting Officer, shall determine the cause of the deficiency and the corrective measures necessary. After the necessary corrective measures have been determined, the contract may be modified as required. All repair or replacement material/equipment shall be NACE approved and similar to original materials. Installation shall be in compliance with the recommendations of the manufacturers as approved by the Contracting Officer to comply with the contract documents. Replacement materials that are installed shall comply with the applicable portions of NACE RP-OI.

3.2.1 Sacrificial (Galvanic) Anode System:

3.2.1.1 General: Replacing anodes includes boring the hole or trenching, installing the anode, welding or splicing the electrical lead, adjusting the output, and installing test stations. Replacement of anodes shall comply with installation procedures found in NACE RP-OI.

3.2.1.2 Anode Output Adjustment: If required, install a resistor or resistance wire to prevent the anode from delivering excess current. The resistance wire, if used, shall be a nichrome wire, No. 16 or 22 AWG with type TW insulation.

3.2.1.3 Placing the System into Service: Upon completion of all phases of the cathodic protection system, it shall be checked and adjusted for optimum performance before placing in regular service.

3.2.2 Impressed Current (Rectifier Ground Bed) Systems:

3.2.2.1 General: Replacing anodes includes boring the hole or trenching, installing the anode, welding or splicing the electrical lead, adjusting the output, and installing test stations. Replacement of anodes shall comply with installation procedures in NACE RP-OI.

3.2.2.2 Installation: Install anodes similarly to the anodes in the initial installation. Replacement anodes are normally installed in auger-bored holes drilled adjacent to the damaged or deteriorated anode. Install anodes below the center line of the protected structure. Anodes may be placed horizontally if obstructions are encountered. Backfill material shall consist of coke breeze compacted in 6-inch layers. Foreign material shall be excluded from the backfill.

3.2.2.3 Electrical Splices and Connections: Negative cable connections shall be thermit-welded in compliance with the weld manufacturer's instruction. Cover the connection with an approved backfill shield placed over the weld connection. The shields shall be sized to cover the exposed metal.

3.2.2.4 Placing the System into Service: Upon completion of all phases of the cathodic protection system, it shall be checked and adjusted for optimum performance before placing in regular service.

3.2.2.5 Interference Testing: Make interference testing on all structures installed under this contract to locate damage being caused by existing or new impressed current cathodic protection systems or other sources of interference. It shall be the Contractor's responsibility to correct all interferences.

3.3 Maintenance and Operating Instructions: The Contractor shall contribute technical data to the cathodic protection records file maintained by the Contracting Officer. These technical records shall include such items as manufacturers data on installed equipment, operating instructions, lists of repair





## 16000 - Electrical

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parts, names and addresses or sources of parts and services, current price lists, repair and maintenance instructions, construction specifications and shop drawings, and as-built drawings of the system.

- 3.3.1 Consolidation of Records: The Contractor shall consolidate all cathodic protection records including surveys, inspections, operating data, maps, charts, location of leaks (leak maps), and manufacturers' parts manual.
- 3.3.2 Updating Records: Update any cathodic protection location maps to show any changes in location or addition of test points or stations, anodes, wiring, etc.
- 3.3.3 Manuals: When the system has been modified or new components have been added, the Contractor shall prepare and furnish the Contracting Officer six copies of operation and maintenance manuals of the cathodic protection system for guidance of using agency personnel. Prepare manual with contents as determined by the Contracting Officer.

END OF SECTION 16641



SECTION 16670  
LIGHTNING ARRESTERS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of lightning arresters. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be required to support the work.
- 2.0 PRODUCTS: Arresters shall comply with ANSI C62.1 and ANSI C62.2.
- 3.0 EXECUTION:
- 3.1 Scheduling and Coordination: Contractor shall ensure that power interruptions have been scheduled and approved.
- 3.2 Workmanship shall be in compliance with ASNI C2.
- 3.3 Cleaning: Clean work areas and materials of dirt, grime, grease, and debris.
- 3.4 Expulsion Arresters shall be inspected for depleted fiber material and thin walls. Report deficiencies to the Contracting Officer.

END OF SECTION 16670



## SECTION 16680

### DIESEL-ENGINE GENERATOR SET

#### PART I - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and Conditions of the Contract, including the General Conditions and Supplementary Conditions apply to the work of this Section.

##### 1.2 DESCRIPTION OF WORK

- A. General: The power plant covered by this Specifications shall embody a 100 kW electric generating unit specified herein together with all associated equipment. All equipment shall be new.
- B. Defective equipment shall be repaired or replaced promptly upon notification of the Contracting Officer or his authorized representative, and in a manner approved by the Contracting Officer or his authorized representative.

##### 1.3 UNIT DESCRIPTION

- A. The emergency power unit shall consist of diesel engine directly connected to alternating current generator without any form of belt, gear, or chain drive. Engine and generator shall be mounted on a common subbase which shall be mounted on vibration absorbing mounts and weatherproof housing.
- B. The unit shall be complete with all necessary equipment for continuous operation. Direct-connected auxiliary equipment for the unit shall include, but not be limited to:

Cooling water	Duplex Fuel Filter
Circulation Pump	Duplex Lube Oil Filter
Lube Oil Pump	Water Cooled Oil Cooler
Fuel Piping installed	Temperature Sensing Devices
On Unit	For Jacket Water and Lube
Pressure Gage for Oil	Oil

##### 1.4 SUPERVISION

- A. Successful bidder shall furnish a qualified representative to assist in the startup and check-out of the equipment.
- B. The representative shall likewise instruct Corpus Christi Army Depot Representative in the proper operation of the plant.

##### 1.5 UNIT AND RATING



## 16000 - Electrical

A. The generating unit is required, and the rating therefore shall be as follows:

- |    |                                   |                  |
|----|-----------------------------------|------------------|
| 1. | Number of Units                   | (One) 1          |
| 2. | Output Rating, Continuous Standby | 100Kw/125KVA     |
| 3. | Power Factor                      | .80              |
| 4. | Frequency                         | 60 cycles        |
| 5. | Voltage, 3-phase, 4-wire          | 120/208 volts    |
|    |                                   | 4-wire 3-phase   |
|    |                                   | 60 cycles        |
| 6. | Voltage Regulation:               |                  |
|    | No load to full load              | Plus or minus 1% |
| 7. | Speed (Maximum)                   | 1800 RPM         |
| 8. | Frequency Regulation              | 5%               |

### PART 2 - PRODUCTS

#### 2.1 ENGINE

- A. The engine shall be of the general purpose, stationary solid injection, internal combustion, diesel, turbocharger, water-cooled, 2-cycle or 4-cycle, compression ignition type. The engine-driven pumps and devices shall be suited, and have the capacities required, to function properly with the separately mounted equipment covered herein, or otherwise provided as a part of the contract. Full load operation of the generator at synchronous speed shall require not more than 85% of the maximum horsepower which the engine will develop and maintain at the synchronous speed of the generator for at least two (2) hours when the engine is in proper adjustment.
- B. The engine shall operate without overheating or suffering mechanical damage or excessive wear when driving the generator under the conditions specified herein.

The engine shall develop the required brake horsepower when operating on Number Two (2) fuel oil with manufacturer's recommended lubrication oil. The engine generator set shall be supplied with spring vibration absorbers of a size recommended by the engine manufacturer.

#### 2.2 FUEL PUMP

- A. Fuel pump shall be of the positive displacement type, built-in, engine driven, and shall be capable of supplying an adequate quantity of fuel under all conditions of operation specified herein. Fuel oil piping shall be of low pressure type. High fuel oil pressures shall be confined to the immediate vicinity of the fuel oil injectors for individual cylinders.
- B. Fuel pump suction shall be piped to the edge of the sub-base and provided with suitable shut-off valve.
- C. Fuel oil pumps shall be capable of satisfactory operation under conditions of 8 ft. suction lift.

#### 2.3 LUBRICATION SYSTEM



- A. The engine lubricating system shall operate under constant pressure as determined by manufacturer with the circulation maintained by means of engine-driven, positive displacement, lubricating oil pump. Sump pump, relief valves, and bypass valves shall be furnished if required for proper operation. Pipe connections and valve for addition of lube oil engine shall be brought to edge of sub-base. A locked drain shall be provided.

#### 2.4 LUBRICATING OIL COOLER

- A. One (1) shell and tube cooler shall be mounted on the engine. The capacity of the unit shall be as recommended by the engine manufacturer.

#### 2.5 LUBRICATING OIL FILTERS

- A. Appropriate filters, of a capacity as recommended by the engine manufacturer, shall be furnished for the engine. Minimum requirements are two (2) filters in parallel. Filters shall be full-flow type, with automatic bypass and alarm connections to indicate opening of bypass.

#### 2.6 GOVERNING SYSTEM

- A. The governor shall be of the self-contained, electronic type governor. The governor shall be capable of holding the engine speed constant within 1/4 load and full load. The governor shall re-establish stable engine operating conditions within 4 seconds following any sudden change in load of not more than 50% of full rated load. Stable engine operation shall be defined as an operation with an engine speed which is constant to within plus or minus 0.3%. The maximum change in speed during the 4 second surging period shall not exceed 6% of rated speed for sudden changes of not more than 50% of full rated load.
- B. A switch on the engine instrument board shall provide for changing the governed speed setting throughout the engine load range while the engine is in operation. The governor shall be capable of adjustment for any value of drop between 0% and 5% of full load speed.

#### 2.7 COOLING SYSTEM

- A. An integral (engine mounted) radiator with engine driven fan for blowing air horizontally shall be supplied per manufacturer's recommendations. Radiator shall be of sufficient capacity to cool the amount of engine coolant necessary for operations under loading conditions.
- B. Radiator shall have sufficient capacity to provide lube oil and jacket water temperatures required by engine manufacturer. Jacket water temperature shall not exceed 200 degree F. when engine is operating at 120 percent rated load. Jacket water heaters of sufficient capacity to maintain the jacket water at 160 degree F. with an ambient temperature of ) degrees F., thermostatically controlled, shall be furnished.

#### 2.8 AIR INTAKE SYSTEM

- A. An approved heavy duty 2 stage air cleaner shall be provided. An indicator shall be installed on the filter that will indicate when element needs changing. One (1) spare filter shall be provided with unit.

#### 2.9 STARTING SYSTEM

- A. Starting shall be accomplished by means of battery-driven electric starting motors with Bendix type pinion drive.



## 16000 - Electrical

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Engine starting batteries shall be of the Lead Acid, 24 volts, manufactured with pocket plates and shall have sufficient capacity to start engine in accordance with requirements of the engine manufacturer. A suitable rack shall be provided for the mounting of each battery. One set of batteries shall be supplied. The batteries shall be capable of starting 175 kW unit in 15 seconds.

### 2.10 BATTERY CHARGER

- A. The engine battery charger unit shall be of two-rate high reactance transformer type suitable for keeping battery charged at the floating voltage. A high rate charge shall be provided by means of an automatic relay switch (internal to unit. Input shall be connected to load side of automatic transfer switch. The output voltage and current shall be suitable to maintain the battery selected. The charger shall be equipped with an auxiliary relay which shall remove the charger from the line during engine cranking period. Charger shall be provided with primary and secondary circuit breakers. The high rate of charge shall be 10 amperes (minimum), low rate shall be as necessary to maintain battery voltage plus 2 volts.

### 2.11 SILENCER

- A. An exhaust silencer capable of residential type silencing shall be furnished with engine. The silencer shall be of the outside type arranged for vertical installation. Expose ferrous parts shall be treated to prevent rust or shall be painted with weather-resistant finish. A condensate drain hole shall be provided in the bottom of the muffler. A flexible exhaust connection shall be provided between exhaust pipe and engine. A rain cap shall be provided to prevent rainwater in getting into the muffler.

### 2.12 INSTRUMENT BOARD

- A. The engine shall be provided with its own instrument board including, but not limited to the following equipment, all properly connected for the desired services.

Engine Hour Meter	Audible Safety Alarm for low
Lube Oil Temperature Gage	And High Oil Pressure
Lube Oil Pressure Gage	Tachometer, Mechanical
Coolant Temperature Gage	Type of the proper scale
Charging Current indicator	Over crank shutdown
	Over speed shutdown

### 2.13 FLYWHEEL

- A. The flywheel shall be both statically and dynamically balanced and capable of being rotated at 125% of rated speed without injury, and shall be adequately protected by means of removable guards. An appropriate means shall be provided for barring, during repairs or inspection.

### 2.14 REMOTE ALARM AND SAFETY CONTROL PANEL

- A. Devices and wiring shall be provided to sound audible alarm under the condition of low lubricating oil pressure and high water temperature. A similar circuit shall shut down the engine and open the breaker if oil pressure drops to 5 psi. An over-speed trip, set at 6% above the rated engine speed, shall also be provided to shut down the engine. A manual override switch shall be provided. Indicators for generator run, fault, low fuel shall also be provided.



2.15 GENERATOR

- A. The electric generator shall have capacity ratings, as specified elsewhere in these Specifications, 80% power factor, 70 degree C. rise over 40 degree C. ambient, 1800 RPM, 120/208 volts, 3-phase, 4-wire WYE, 60 cycle NEMA Class F insulation. Generator shall be designed for continuous duty in all respects. The generators shall be of the revolving field type, single ball bearing construction, complete with adapter and coupling. The generators shall not be supplied with brushes, commutator, or slip rings or other types of sliding electric contacts. The generator terminal boxes shall be of adequate size to accommodate all necessary external connections from the generator to externally located associated engine control panel. The generator exciter shall be equipped with a rotating rectifier assembly, and shall effect a minimum of 75% normal voltage output at the main generator terminals from an automatic field flashing circuit incorporated in the voltage regulator and mutual field flashing shall not be necessary after initial flashing.

2.16 JACKET WATER HEATER

- A. Thermal circulating type jacket water heater with thermostat to keep engine temperature at 80 degrees F. in a 20 degree F ambient.

2.17 HOUSING

- A. Provide a water resistant enclosure completely covering the engine generator set constructed of aluminum. Smooth exterior panels of pre-finished with heavy gauge aluminum shall be riveted to extruded aluminum posts. The roof shall be of aluminum sheet overlaying extruded aluminum "1" beams. A minimum three aluminum doors with locking provisions shall be provided to ensure ease of access for operating and maintenance. A radiator cap access door shall be provided. All hardware shall be stainless steel. Steel and other material subject to oxidation and deterioration over the expected twenty to thirty year life of the set will not be accepted.

2.18 EQUIPMENT FINISH

- A. The engine generator unit, including its accessories, exciter, and generator, shall be finished at the manufacturer's plant in accordance with manufacturer's color scheme. Surfaces shall preferably be finished by a spray method. Prior to acceptance by the D.C. Public Schools, finished surfaces shall be touched up where necessary, to remove all scars, tool marks, or scratches received during or prior to erecting at the site.

2.19 SPARE PARTS

- A. The following spare parts shall be supplied for each engine:
  - 1. One complete set of filter elements (Air and Fuel).
  - 2. Twelve (12) Lube Oil Filter Elements.

2.20 INSTRUCTIONS

- A. Complete instructions covering the operation of the engine generator unit and associated equipment shall be provided for the plant, together with an operational and maintenance manual.
- B. A single parts manual shall be included which shows a complete parts breakdown of the engine and generator. The instructions shall include a wiring diagram of equipment connections with all



## 16000 - Electrical

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items and terminals clearly identified, and an engine parts catalog. Two copies of all documents shall be furnished.

### 2.21 DAY TANK

- A. The generator shall be provided with a built-in base mounted day tank with the capacity of 250 gallons complete with piping to the engine.

### 2.22 AUTOMATIC TRANSFER SWITCH

#### A. General:

1. Provide 1 - 400 amp, 208 volt, 3-phase, 4-wire, 60-cycle automatic transfer switches 65,000 A RMS Sym withstanding rating.
2. Transfer switch shall perform the following functions:
  - a. The automatic transfer switch shall be arranged to allow 3 to 6 second time delay after power failure and shall then actuate the Engine Starter System and when the engine generator reaches full voltage shall transfer load from normal power source to emergency power source.
  - b. Upon restoration of normal source on all phases, the load shall be retransferred to the normal source after a time delay of from 2-25 minutes (adjustable).
  - c. The load shall be transferred to the emergency source when any phase of the normal source drops to 70% or less of rated voltage and shall be transferred to the normal source when all phases are restored to 90% or more of rated voltage.
  - d. Time of transfer shall not exceed 20 cycles in either direction.
  - e. The transfer switch shall be operated by a momentary energized electrical mechanism. Operating current for transfer shall be obtained from the source to which the load is to be transferred.
  - f. No neutral position shall be possible and failure of any component shall not permit a neutral or off position. The switch shall be positively locked in either the normal or emergency position without hook, latches, magnets or springs.
  - g. The switch shall be capable of closing on in-rush current equal to 20 times continuous duty rating, and shall be capable of transferring successfully in both directions without damage to the electrical operation, with 90% of rated frequency impressed on the normal and emergency sides of the switch.
3. The transfer switch shall be in accordance with the requirements of Underwriters' Laboratories, inc., "Standards for Safety, Emergency Lighting Equipment, UL 1008", and as specified herein.

When the following paragraphs exceed the requirements of the Underwriters' Laboratories, Inc., these paragraphs shall govern.

4. The transfer switch shall be rated for continuous duty in an unventilated enclosure at a maximum line voltage of 600 volts and shall be suitable for operation on circuits having resistive and inductive loads. A derating factor of 30% will be applied to meet the continuous duty rating required for the switch.





5. Cabinet and Interior Arrangement:
  - a. The automatic transfer switch shall be of enclosed type equipped for wall-mounting against the wall at the location shown.
  - b. All internal connections and all component parts such as contacts, coils, relays and appurtenances shall be accessible from the front of the panel without major disassembly of associated parts of making connections or replacement of components.
6. Load Position indicator:
  - a. Provide amber indicating light to indicate operation on emergency power and a red indicating light indicate operation on normal power.
  - b. Indicating light shall be fused and shall be identified with nameplates entitled "emergency power" and "normal power".
7. A test switch to simulate normal failure shall be provided.
  - a. The automatic transfer switch shall be three pole with overlapping neutral transfer contacts. The neutrals of the normal and emergency power sources shall be connected together only during the transfer and retransfer operation and remain connected together until power source contacts close on the source to which transfer or retransfer is being made. The overlapping neutral transfer contracts shall not overlap for a time duration greater than milliseconds. A non-overlapping neutral transfer (fourth) pole shall be submitted for approval before any substitution is made.
  - b. Transfer Switch:
    1. The switch shall be of the electrically operated mechanically held type and shall be done through with the contacts mechanically interlocked securely on a common shaft and so arranged that a movement of the shaft will move both normal and emergency sources being connected to or disconnected from the load at the same time.
  - c. Manual Contacts:
    1. Main contacts shall be mechanically locked in position to prevent burning or welding under short circuit conditions.
    2. Main contacts shall be silver-surfaced or silver tungsten alloy and protected by separate arc chutes on all poles or other provisions for inductive load rating and shall be capable of closing on in-rush current without burnish or welding of contacts.
  - d. Relays:
    1. All relays shall met NEMA and IEEE test standards for industrial type power relays.
    2. All relay contacts shall be capable of carrying 10 amps continuously.
    3. The relay shall be of the highest quality of nationally reputable manufacturers.



## 16000 - Electrical

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- e. Temperature rise shall not exceed the following:
  - 1. 65 degree C. rise at the transfer switch main contact.
  - 2. 50 degree C. rise on the bus bars.
  - 3. 50 degree C. rise on the transfer switch terminal.
- f. Tests:
  - 1. Tests shall be performed to establish conformance with the requirements specified herein.
  - 2. All tests for each switch rating shall be performed on a single test sample.
  - 3. Test result shall be certified by a recognized independent testing laboratory and shall show that interruption tests, close-on-rush tests, short circuit test, endurance tests, post endurance temperature tests, and dielectric strength tests have been conducted on switches of the same amp rating, with voltage, equal to or greater than the voltage of the systems on which the switch is to be installed.
    - a. Single pole or single phase test data will be acceptable for a three-phase switch.
  - 4. The switch shall be tested to withstand current in accordance with UL Standards, except that contact welding or separation will not be permitted.
  - 5. The switch provided under this Specification shall be tested under full load conditions.
  - 6. During test, normal and emergency sources shall be separated 120-electrical degrees.
  - 7. The temperature rise above ambient of the main contacts at the end of the endurance test shall not exceed 65 degree.
- g. With the contacts carrying rated current. The temperature reading shall be taken in this fashion:
  - 1. At the conclusion of the endurance test, the transfer switch shall be energized from the normal source at full nameplate current rating (low-voltage may be used for this test provided normal sources relays are energized at the transfer switch rating voltage).
  - 2. Every thirty minutes, temperature reading by thermometer couple shall be taken and recorded at the transfer switch contacts until the temperature stabilizes.
  - 3. Stabilization occurs when three consecutive readings, taken at ten-minute intervals, show no increases in temperature rise above ambient, and do not exceed the specified value.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION



- A. Drawings are diagrammatic, indicating principal requirements but not necessarily all required details of installation.
- B. All equipment shall be installed as recommended by the manufacturer to conform to the particular application involved in accordance with details as shown and specified.
- C. Installation shall securely anchor engine generator set and transfer switch in location shown, coordinating with other trades for complete installation ready to operate.
- D. Prior acceptance by the Corpus Christi Army Depot finished surfaces shall be touched up where necessary to remove all scars, tool marks, or scratch received during or prior to erection on-site. Paint with matching materials and colors.

### 3.2 TESTING AND INSTRUCTIONS

- A. Start-up and check-out of the equipment shall be done in the presence of qualified representative of the manufacturer on-site after installation is complete to assure that all components and appurtenances are functioning and conform to the tests and performance criteria specified for factory test.
- B. Manufacturer's representative shall instruct D.C. Public School's Representative on the operation of the equipment for a period of two days.

END OF SECTION 16680



## SECTION 16721

### FIRE ALARM AND DETECTION EQUIPMENT

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of fire alarm and detection equipment. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturers recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS :
- 2.1 Control Unit and Annunciator: FM Approval Guide, Fed. Spec. W-F-391C and W-F-398.
- 2.2 Lamps shall be long-life neon.
- 2.3 Contacts shall be rated 5 amperes, 120 volts.
- 2.4 Power Supply shall be solid-state, NEMA RI-3 for dc systems, FMS for ac systems. No attempt to repair solid-state components shall be made.
- 2.5 Heat Detectors:
- 2.5.1 Fixed Temperature, Self-Restoring Heat Detector shall have bi-metallic element to close electrical contacts when heated.
- 2.5.2 Combination Fixed Temperature and Rate-of-Rise, Self-Restoring Heat Detector shall have both a bimetallic element to close electrical contacts and a rate-of-rise element with an air chamber, a flexible metal diaphragm, and a moisture-proof vent. Rate-of-rise element shall be independent of fixed temperature action and shall respond when the rate-of-temperature rise exceeds 15 F per minute.
- 2.5.3 Fixed Temperature Rate Compensated Heat Detectors shall have an expandable outer shell sensitive to surrounding air temperature, which compensates for thermal lag of external temperature.
- 2.5.4 Fixed Temperature, Non-restorable Heat Detector shall have phosphor bronze spring held under tension by a fusible link to hold open contacts. Indicator hole shall appear in the detector chamber set to indicate the fired detector.
- 2.5.5 Combination Fixed Temperature and Rate-of-Rise, Non-restorable Heat Detector shall have a phosphor bronze spring held under tension by a fusible link to hold open contacts and a rate-of-rise element with an air chamber, a flexible metal diaphragm, and a moisture-proof vent.
- Rate-of-rise element shall be independent of fixed temperature action and shall respond when the rate of temperature rise exceeds 15 F per minute.
- 2.6 Flame Detector shall consist of a silicon photo-electric cell located behind a convex, infrared filter lens. Time delays to prevent false actuation shall be three seconds, ten seconds, or thirty seconds.
- 2.7 Fire Alarm Transmitters and Receivers:



- 2.7.1 Emergency Power Supply shall be a completely automatic unit consisting of batteries, battery charging unit to automatically maintain the batteries, and an inverter to change dc battery power to 120 volt, 60 hertz ac power.
- 2.7.2 Control Relays: Replacement relays shall be totally enclosed with heat and shock-resistant dust covers.
- 2.7.3 Trouble Buzzer shall be integrally mounted in the control unit.
- 2.8 Single Station Smoke Detectors (Self-Contained):
  - 2.8.1 Detector Base shall be plug-in type plastic base.
  - 2.8.2 Detectors shall be self-contained control unit that accepts either ionization, photo-electric, or flame detectors. Ionization. Detectors shall be of the dual chamber type. Ionization detectors shall comply with UL67 and II7. Photo-electric detectors shall comply with ULI68.
- 2.9 Duct Smoke Detectors shall be either ionization type or photo-electric type. Ionization detector shall be of the dual chamber type. Ionization detectors shall comply with ULI67 and hot electric detectors shall comply with UL168.
- 2.10 Interlocks:
  - 2.10.1 Contact Rating: At 277 volts, contacts shall be rated 15 amperes at 75 percent power factor.
  - 2.10.2 Horsepower Rating: Contacts shall be rated for 1-1/2 horsepower at 230 volts.
  - 2.10.3 Contact Voltage: Minimum contact voltage rating shall be 277 volts.
  - 2.10.4 Coil Voltage shall be selected to suit voltage of system.
- 2.11 Batteries: Fed. Spec. W-B-I34C.
- 2.12 End-of-Line Resistors, Balancing Resistors, and Diodes: Fed. Spec. W-F-39IC and W-F-398B.
- 2.13 Manual Stations: UL 38, flush or semi-flush mounted, pull-lever.
- 2.14 Wiring: NFPA 72A and 72D.
- 2.15 Audible Alarms: Fed. Spec. W-F-39IC and W-F-398B.
- 3.0 EXECUTION:
  - 3.1 Coordination: Contractor shall determine that required notices have been given and disconnection of equipment will not create a false alarm.
  - 3.2 Workmanship: NFPA 70, 72A, 72D, and 72E.
  - 3.3 Defective Ionization Detectors that are replaced shall be returned to manufacturer for proper disposal.

END OF SECTION 16721



## 16000 - Electrical

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### SECTION 16722

#### CARD ACCESS CONTROL SYSTEM

##### 1.0 GENERAL:

- 1.1. The Electrical Contractor shall furnish and install all items of equipment indicated or hereinafter specified to equip the building with an effective, easy-to-use solution for controlling the movement of people into and within the building. Also all associated conduit, wire, outlet boxes and mounting hardware.
- 1.2. The Contractor shall submit engineered drawings of the proposed layout.

##### 2.0 EQUIPMENT AND MATERIALS FOR SYSTEM:

- 2.1. Card Read - Indoor or Outdoor use.
- 2.2. Door Strike(Magnetic door switch)
- 2.3. Alarms/Signaling devices(horns, sirens, buzzers or bells)
- 2.4. Command Station

##### 3.0 TEST AND GUARANTEE SYSTEM:

- 3.1. The Contractor shall upon completion of the system provide a system operating at maximum capability and effectiveness. The equipment shall be demonstrated to operate in accordance with Corpus Christi Army Depot expectations and comply with all local and national codes.
- 3.2. The Electrical Contractors shall present before final payment for this system a certified statement by the manufacturer or his agent that he has generally supervised the installation. That he will warrant the system for one year after date of acceptance and adjust or replace defective materials, workmanship or equipment.

END OF SECTION 16722



## SECTION 16730

### CLOCK AND PROGRAM SYSTEMS

1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials to include repair and maintenance of clock and program systems. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.

2.0 PRODUCTS :

2.1 Astronomical Time Switch: The Contractor shall furnish, install, and connect Astronomical Time Switches where directed. These switches shall be three pole, single throw when controlling three circuits. When two circuits are to be controlled, the switch shall be a two pole, single throw. Switch contacts shall be rated 40 amperes per pole at 277 volts. The time switch shall be 24 hours, Astronomic year.

The "ON" operation shall occur automatically at sunset, the "OFF" operation at sunrise. The clock motor shall be a self-starting synchronous motor rated for 120 volts, 60 HZ, AC Spring driven reserve shall be provided with sufficient capacity to operate time switch contacts at least 36 hours after power failure. On restoration of power, spring driven reserve shall be automatically rewound.

Switch shall be Tork 7300 ZL for three pole or 7200 ZL for two pole, or the equal by Sangamo, Intermatic Register /Company or the Paragon Electric Co.

END OF SECTION 16730



## SECTION 16770

### PUBLIC ADDRESS EQUIPMENT

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of public address equipment. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
- 2.1 Broadcast Microphone Cables: EIA RS-215.
- 2.2 Audio Cable Connectors: EIA RS-297.
- 2.3 Capacitors: EIA RS-153, RS-164, RS-198, and RS-395, as applicable.
- 2.4 Ceramic-Base Printed Circuits: EIA RS-161, and RS-162.
- 2.5 Component Parts: Standard test method of EIA RS-186.
- 2.6 Thermoplastic Hood-up Wire: EIA RS-230 and ASTM B 286
- 2.7 Inductors: EIA RS--175, or RS-197.
- 2.8 Loudspeakers: EIA RS-278 and SE-103.
- 2.9 Microphones: EIA SE-105.
- 2.10 Panel Mounting Racks: EIA RS-310.
- 2.11 Resistors: EIA RS-155, RS-172, RS-196, RS-303, RS-322 and 324.
- 2.12 Sound System: EIA RS-160.
- 2.13 Tape Equipment: NAB Standard Magnetic Tape (Reel to Reel) Recordings and Reproductions.
- 2.14 Transformers: EIA RS-174, RS-180, RS-183, RS-393.
- 2.15 AM-FM Tuners: The AM-FM tuners shall have a tuning range of 540 kHz to 1605 kHz for AM and 88 to 108 MHz for FM and shall comply with FCC Rules and Regulations, Part 15. Controls shall include AM-FM selector switch, power switch with pilot light, signal strength meter, and tuning control with illuminated scale.
- 2.16 Phonograph: Phonograph shall conform to the requirements of NAB Disc Recording and Reproducing Standard and shall play in the automatic and manual modes. The phonograph shall have two speeds of operation, 33-1/3 rpm and 45 rpm, adjustable over 3 percent of the range. Deviation from the mean speed (wow and flutter) shall not exceed 0.1 percent.
- 2.17 Magnetic Tape Equipment: Tape equipment shall be provided for monophonic recording and playback, of at least a 30 dB dynamic range of input signal. The record and playback heads shall be





separate with the playback head arranged to monitor while the recording is made. Hum and noise shall be at least 50 dB below full output.

- 2.17.1 Cassette Tape Equipment: Tape speed shall be 1-7/8 ips. Frequency response shall be within plus or minus 3 dB from 40 to 14,000 Hz, with less than 0.16 percent wow and flutter. Signal to noise ratio shall be at least 50 dB.
- 2.17.2 Automatic Tape Reproducer: At a tape speed of 7-1/2 ips, the reproducer shall have a frequency response within plus or minus 2 dB from 40 Hz to 15,000 Hz. Wow and flutter shall be not greater than 0.25 percent; and signal to noise ratio, not less than 50 dB.
- 2.18 Preamplifiers:
  - 2.18.1 Microphone Preamplifiers: If required, microphone preamplifiers shall be matched to the microphone.
  - 2.18.2 Mixer Preamplifier: Preamplifier shall be of the general purpose type, to mix and control at least five inputs. Phonograph equalization shall meet the requirements of RIAA Publication, Standard Recording and Reproducing Characteristics. Preamplifier shall be provided with independent low-frequency and high-frequency tone controls to adjust bass and treble response at the output, a monitor volume control, monitor jack, illuminated volume unit meter, power switch, and master volume controls.
  - 2.18.3 Radio Frequency Preamplifier: The preamplifier shall have a minimum of 14 dB gain over the FM band with a noise figure not greater than 4.2 dB.
- 2.19 Power Amplifiers: Frequency response shall be within plus or minus 1 dB from 25Hz to 19,000 Hz, and total harmonic distortion shall not exceed 0.5 percent at rated output. Output shall incorporate automatic resetting, protective electronic circuitry to prevent amplifier damage of any kind due to amplifier output opens or shorts.
- 2.20 Equipment Racks: Equipment shall be mounted in 19-inch racks in accordance with EIA RS-310. Ventilated rear panels, solid side panels, and solid top panels shall be provided.
- 2.21 AM/FM Antenna: The AM/FM antenna shall be roof-mounted suitable for both AM and FM reception and shall cover all frequency bands specified for radio tuners. Coaxial cable attenuation shall not exceed 2.5 dB over the FM radio band.
- 3.0 EXECUTION:
  - 3.1 Connections to Existing System: Alarm or emergency systems shall not be interrupted. If required, work shall be scheduled after normal working hours. Existing disturbed work shall be restored to its original condition including maintenance of wiring continuity.
  - 3.2 Temporary Shutdowns: Temporary shutdowns of existing systems shall be made at times that will not interfere with normal operation of existing facilities, and only with written consent of the Contracting Officer.

END OF SECTION 16770



## 16000 - Electrical

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### SECTION 16850

#### INSTITUTIONAL ELECTRIC HEATING EQUIPMENT

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of materials to include repair and maintenance of institutional electric heating equipment. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS
  - 2.1 Controls: NEMA DC4, UL 20, UL 917, and UL 1020.
  - 2.2 Heaters: NEMA HE2 and UL 499.
  - 2.3 General Electrical: NFPA 70 and 70B.
- 3.0 EXECUTION
  - 3.1 Coordination: Contractor shall determine that heating equipment has been de-energized. Temporary heaters shall be supplied if required to maintain temperature.
  - 3.2 Motor Repair: Electric motors to be repaired shall be done by a shop specializing in the repair of motors.

END OF SECTION 16850



## SECTION 16851

### ELECTRIC UNIT HEATERS

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of electrical unit heaters. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS
  - 2.1 Heating Element shall have nickel-chromium wire packed in high purity magnesium oxide enclosed in a corrosion-resistant sheath. The embedded sheath shall be the manufacturer's standard design.
  - 2.2 Housing shall be fabricated from sheet steel complying with ASTM A 569. The housing shall be provided with means for suspension. Deflector blades shall be constructed of same material as housing and shall be manufacturer's standard design and operation.
  - 2.3 Fan shall be the propeller type fabricated of aluminum or steel with permanently lubricated bearing propeller. Propeller shall be dynamically balanced.
  - 2.4 Controls
    - 2.4.1 Safety type Thermal Overload Cutout, Manual Reset, Type shall be provided as part of the equipment to disconnect the hot elements in the event normal operating temperatures are exceeded.
    - 2.4.2 Thermostat shall be unit (on extension approx. 2' long attached to the body by bolting) or wall mounted as indicated and shall be heavy-duty type with enclosed contacts normally used by manufacturer, with a 3-position selector "Fan-off-heat" switch activate through contactor if amperage exceeds stat rating. Control circuit voltage shall not exceed 30 volts as provided by a factory-installed control circuit transformer.
- 3.0 EXECUTION
  - 3.1 Coordination and Scheduling: Contractor shall ensure that power interruptions have been scheduled and approved by the building supervisor.
  - 3.2 Workmanship: Installation work shall be in compliance with the National Electric Code and jurisdictional authorities.

END OF SECTION 16851



## SECTION 16859

### ATHLETIC FIELD SOUND SYSTEM and PORTABLE SOUND AMPLIFIER

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishing and installation of Athletic Field Sound Systems. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 1.1 Scope: Electrical Contractor shall furnish, install an athletic field sound system to match the existing or as directed by the Contracting Officer. Work shall included but not be limited to all associated equipment, conduit, wire, boxes, mounting hardware, etc.
- A. This system shall be a single or multiple channel unit, providing for the reproduction and distribution sound from a central microphone location or locations.
- B. The system power amplifier shall provide a 70 volt output to the horn/speakers as specified hereinafter.
- For conduits, boxes, fittings, etc., see Section 16-5, Conduit and Raceway systems and Section 16-6 Outlet and Enclosing Boxes.
- 1.2 Conductors: The Electrical Contractor shall furnish and install Belden Cable #8760 or approved equal for inputs (MIC) and outputs (LS) for Athletic Field Sound System.
- 1.3 Amplifier - portable type: The amplifier shall be equal to "Yorkville" Power "Beta", continuous average power 90 watts into 8 OHMS, 150 watts into 4 ohms, 20 to 20Khz. 90 dB signal to noise ration, 0.4% total harmonic distortion, mono, 1/4" phone input connector, 22 pounds weight. Beta model 150. Dual inputs.
- 1.4 Speakers: Equal to "Yorkville" 2-way, 160 power rating, 8ohms, 10" woofer, RCF horn, 1" RCF horn driver, Freq. response + or -3 dB, 65 to 19 kHz. Max sound pressure level at 1m. 118DB.
- 1.5 Guarantee: The Contractor shall present before final payment for this system a certified statement by the sound manufacturer or his agent that he/she has generally supervised the installation and test of the system on completion of the work; that the Contractor shall warrant the system for one (1) year after date of acceptance by Corpus Christi Army Depot
- Any defect arising during the warranty period shall be repaired using new components of same mfgr. or repairing existing components to original specifications at no cost to the Corpus Christi Army Depot.
- 1.6 List of approved equipment where required by drawings or specific specifications:
- Technics RS-T8OR Cassette Deck
  - Tascam 122MKII Cassette Deck
  - Shure 514B Hand Held Microphone
  - Shure AMS24 Gooseneck Microphone



- e. Shure AMS 26 Probe Microphone
- f. Tascam M-106 Mixing Console
- g. Urie 539 Equalizer
- h. Ramp/KO XL4S/8M Distribution Amplifier
- i. JBL6260 Power Amplifier
- j. Soundolier PS24-20 DC Power Supply
- k. Soundolier TPS24-20 Telephone Power Supply
- l. WE-O-PT Telephone Intercom Handset
- m. 3M 2100 Overhead Projector
- n. Crestron ECS-32 Decoder
- o. Crestron EPC-1 Power Controls
- p. Crestron ESC-1
- q. Crestron EVC-1 Volume Controls
- r. Crestron EWP-2/32 Remote Control Panel
- s. Soundolier HX31-345 3" Speaker

1.7 MIXER:

1.7.1 Automatic microphone system: Output level at full gain, 1KHz. One channel gated "on", off-attenuator at -15, using the mike probe equal to an AMS-26. Output termination:

- a. Line = 600 ohms
- b. Mike = 150 ohms
- c. Aux. = 50 k
- d. Direct = 50 k
- e. Phones = 200 ohms

1.7.2 Input microphone sensitivity (72db)

- a. Line = +15
- b. Mic = -34dBV
- c. Aux = +17dBV
- d. Direct = -56dBV
- e. Phones = -4dBV
- f. Input clipping level at 1KHz = 128 dBV

1.7.3 Input Auxiliary Sensitivity -22dBV



## 16000 - Electrical

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- a. Line = +15.8 dBV
- b. Mic = -34 dBV
- c. Aux = +17 dBV
- d. Direct = No
- e. Phones = -4 dBV
- f. Input clipping level at 1KHz = +7dBV to +20dBV

### 1.7.4 Frequency Response

- a. Mic input to outputs = 70 to 20,000 Hz.  $\pm$  2db with low frequency cutoff of 50 Hz.
- b. Aux. Input to outputs = 30 to 20,000 Hz.  $\pm$  2db.
- c. Aux. Input to output = 70k or larger unbalanced. Less than 10k source impedance.

### 1.7.5 Output impedance

- a. Mic = 150 ohm balanced, internal actual 1 ohm, output clipping level of -34 dbv.
- b. Line = 600 ohm balanced lines, 150 ohm internal, output clipping level +15.8 dbv.
- c. Aux = 10k or greater, 2.2k internal, +17dbv output clipping level.
- d. Direct = 10 to 50k unbalanced mic circuit, actual internal 1k, output clipping level 0 dbv.
- e. Phones = 200 ohm, internal 2.2k to tip, 2.2k to ring, -4dbv, output clipping level.

### 1.7.6 Hum and Noise

- a. Equivalent input noise = 27dbspl, a - weighted with AMS-26 mic probe.
- b. Output noise = -62 dbv up = -88 dbv down at 300 to 20,000 Hz off attenuator.
- c. Output hum and noise = -58 dbv with -82dbv (master down), 20 Hz to 20,000 Hz, off attenuator.
- d. Distortion = THD of 0.35% or less 30 to 20,000 Hz at +15dbm
- e. Gating = Attack time = 4 msec.; hold time = 0.5 or 1.0 sec. selectable; decay time = 0.3 sec. after hold internal.
- f. Off attenuation; fixed = -15db; Variable = Infinity to -8.5db

### 1.7.7 Overload and shorting protection

Protected against shorts in inputs or outputs. Mic inputs up to 3 volts should be tolerated. Auxiliary inputs of up to 10 volts should be tolerated.

### 1.7.8 Logic terminals (referred to logic ground terminals)

- a. Inputs = greater than 1.9v high side.
- b. Inputs = low(active) = less than 1.9v and 80 microamps when grounded
- c. Min/Max applied volts =  $\pm$  20v.



- d. Gated outputs = High, 5.0v in series with 10k resistance, source 0.2 MA with 3.0v output. Low(active) = less than 0.5v (100 MA. Max).
  - e. The mixer shall be AMS-8000 or approved equal provided it is fully compatible with all existing and added equipment.
- 1.8 EQUALIZER:
- 1.8.1 An optional accessory Model SC-I Security Cover shall be installed over the front panel to protect all operating controls against inadvertent disturbance or tampering in fixed installations.
  - 1.8.2 Electrical:
    - 1.8.2.1 INPUT: Balanced bridging, differential amplifier.
    - 1.8.2.2 INPUT IMPEDANCE: 40 kohms, used as balanced input. 20 kohms, used as unbalanced (single-ended) input.
    - 1.8.2.3 MAXIMUM INPUT LEVEL: +20 dB (7.75 V rms).
    - 1.8.2.4 EQUIVALENT INPUT NOISE: Less than -90 dBm (15.7 kHz bandwidth) with all controls set flat, output terminated with 600 ohm load.
    - 1.8.2.5 GAIN: EQ out - unity, +/- d8, EQ in - from unity to +20dB.
    - 1.8.2.6 FREQUENCY RESPONSE: +/- dB, 20-20,000 Hz (EQ out), +1d8, -3d8, 20-20,000Hz (EQ in).
    - 1.8.2.7 OUTPUT: Floating, transformer isolated.
    - 1.8.2.8 OUTPUT LOAD: 150 ohms or greater.
    - 1.8.2.9 POWER OUTPUT: +24 dBm into 600 ohm load. (12.28 Volts); +26 dB into 150 ohm load. (7.75 Volts)
    - 1.8.2.10 DISTORTION: Less than 0.5% THD, 30 Hz to 15 kHz at maximum rated output.
    - 1.8.2.11 POWER REQUIREMENTS: 100-125 VAC or 200-250 VAC, 50/60 Hz, switch selectable, less than 10 W.
    - 1.8.2.12 ENVIRONMENT: Operating 0°C to +50°C (+ 32°F to +122°F) storage -20°C to +60°C (-4°F to 140°F).
  - 1.8.3 2. FILTER CHARACTERISTICS:
    - 1.8.3.1 GRAPHIC SECTION: 27 individual 1/3-octave L-C type active filters (1/3-octave at -3dB points with 8 dB cut).
    - 1.8.3.2 CENTER FREQUENCIES: standard ISO (Hz) 40 50 63 80 125 160 200 250 315 400 500 630 800 1K 1.25K 1.6K 2K 2.5K 3.15K 4K 5K 6.3K 8K 10K 12.5K 16K.
    - 1.8.3.3 FREQUENCY ACCURACY: +/- 3% of center frequency.
    - 1.8.3.4 ATTENUATION RANGE: 0 to -15 dB (single filter section).
    - 1.8.3.5 ATTENUATION CALIBRATION: Within 1 dB of indicated setting, 0 to -5 dB, Within 1.5 dB of indicated setting, -5 to -15 dB (single- filter section).
    - 1.8.3.6 BAND LIMIT FILTERS: Low Cut -12 dB/octave, Butterworth, -3 dB point continuously adjustable from 20 Hz to 250 Hz.



## 16000 - Electrical

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High Cut -6 dB or -12 dB/octave, switch-selectable, Butterworth, -3 dB point continuously adjustable from 3.5 kHz to 20 kHz.

### 1.8.4 PHYSICAL:

1.8.4.1 DIMENSIONS: Approximately 483 x 89 mm rack panel; Depth behind panel 203 mm. (19" x 3-1/2" x B")

1.8.4.2 FINISH: Panel is 3.18 mm (1/8") brushed clear anodized aluminum. Chassis, cadmium plated steel.

1.8.4.3 WEIGHT: 5.00 kg (11 pounds).

1.8.4.4 SHIPPING WEIGHT: 7.23 kg (16 pounds).

1.8.4.5 ACCESSORIES: Security Cover.

### 1.8.5 CONTROLS:

1.8.5.1 EQUALIZATION: 27 vertical slide controls, continuously variable 0 to -15 dB.

1.8.5.2 L.F. CUT: Screwdriver adjustable, 20 Hz to 250 Hz.

1.8.5.3 H.F. CUT: Screwdriver adjustable, 3.5 kHz to 20 kHz.

1.8.5.4 H.F. SLOPE: Toggle switch selects 6 dB or 12 dB/octave below -3 dB point.

1.8.5.5 GAIN: Screwdriver adjustable from unity to +20 dB (EQ in).

1.8.5.6 EQ IN/OUT: Front panel toggle switch.

1.8.5.7 POWER: Front panel toggle switch.

1.8.5.8 MAINS VOLTAGE: Rear panel slide switch, 115/230 volt.

1.8.5.9 INDICATORS: LED, power ON. LED, overload condition, level monitored at input and output.

### 1.8.6 CONNECTIONS:

All connections for input and output shall be made through a barrier strip at the rear of the chassis.

1.8.7 Equalizer shall be as manufactured by United Recording Electronics Industries (model 539) or approved equal.

## 1.9 AUDIO POWER AMPLIFIER

1.9.1 The amplifier shall have a rated power of 150 watts, 20 Hz. to 20 kHz, with 8 ohm stereo per channel, 600 watts rated power 20 Hz. to 20 kHz, with 16 ohm bridge.

Mid band power at 1 kHz shall be not less than 190 watts with 8 ohm stereo per channel, 60 watts with 16 ohm bridge.

The rated power shall be minimum continuous sine wave output per channel, with both channels driving their rated load over a power band width of 20 Hz to 20 kHz. Maximum total harmonic or intermod distortion measured at any power level from 250 milliwatts to rated power shall be less than 0.1% for 8 ohm stereo and 16 ohm bridge, 0.2% for 4 ohm stereo and 8 ohm bridge.

### 1.9.1.1 MID BAND POWER





Mid Band power shall be maximum output power at onset of clipping, both channels driven with 1 kHz. Sine Wave, THD 1%.

1.9.1.2 TRANSIENT INTERMOD DISTORTION

The transient intermod distortion shall be 0.03% at rated output.

1.9.1.3 FREQUENCY RESPONSE

The frequency response shall be +0, -1dB, 20 Hz. to 20 kHz at any level up to rated output.

1.9.1.4 NOISE LEVEL

The noise level shall be minimum of 100 dB below rated output in 15.7 kHz, noise bandwidth.

1.9.1.5 INPUT AND INPUT IMPEDANCE

The input shall be balanced bridging differential amplifier. 40k ohms as balanced input, 20k ohms used as unbalanced input when single ended.

1.9.1.6 MAXIMUM INPUT LEVEL

Maximum input level shall be +20 dB. This is when using the zero dB reference as 7.75 volts Root - Mean - Square unless noted otherwise herein.

1.9.1.7 VOLTAGE AMPLIFICATION AND RISE TIME

Voltage amplification shall be variable, maximum of 30 dB. Rise time shall be 7 microseconds.

1.9.1.8 DAMPING FACTOR AND CHANNEL SEPARATION

Shall be greater than 200 with an 8 ohm load at a frequency of 20 HZ to kHz. Channel separation shall be greater than 60 dB at 1 kHz.

1.9.1.9 GENERAL

The amplifier shall be protected against short circuits and shall be stable into reactive loads. Input amplifier shall be protected against excess input current. The speakers shall be protected against any failure in the amplifier by using an internal relay to disconnect the load from the output and connect it to ground. This relay shall disconnect the load if excess DC voltage is detected at the output or if the power supply fails. The relay shall open if the amplifier heats up above the tolerated amount.

The amplifier shall be equal to "JBL"-6260.

END OF SECTION 16859



## SECTION 16900

### CENTRAL MONITORING, CONTROL, AND INSTRUMENTATION

- 1.0 DESCRIPTION OF WORK: This specification covers the furnishings and installation of materials to include repair and maintenance of central monitoring, control, and instrumentation of equipment. Products shall be as directed by the Contracting Officer. Installation procedures shall be in accordance with the product manufacturer's recommendations. Demolition and removal of materials shall be as required to support the work.
- 2.0 PRODUCTS:
  - 2.1 Drawings and Data: Drawings and data on existing monitoring control and instrumentation equipment should be requested from the Contracting Officer.
  - 2.2 Sensing Elements or Transducers: Devices that sense the condition, state or value of a process variable and produce an output that reflects that condition.
  - 2.3 Measurement and Signal Conditioning: Devices that condition and transmits the signal generated by the sensing element and transducers.
  - 2.4 Control Devices: Include any device that performs a definite function in control system, such as any switch (limit, pressure, temperature, on-off, etc.) valves, solenoid, relays, and solid-state control elements.
  - 2.5 Central Monitoring and Control Devices: Include any device that either monitors the signal generated by the transmitters or control devices (indicators, recorders, annunciators, etc.) or provides a final control action from the signal generated by the transmitter such as controllers, computers, etc.
  - 2.6 Product Codes and Standards:
    - 2.6.1 Safety requirements for electrical measuring and controlling: ANSI-C39.5.
    - 2.6.2 Industrial Control Equipment: ANSI C33.76
    - 2.6.3 Electrical Analog Indicating Instruments: ANSI C39.1.
    - 2.6.4 Instrument Transformers: ANSI C39.13.
    - 2.6.5 Industrial Controls and Systems: NEMA-ICS.
    - 2.6.6 National Electrical Code: NFPA-70
    - 2.6.7 Electrical Equipment Maintenance: NFPA-70B
    - 2.6.8 Limit Controls: UL-353
    - 2.6.9 Test Code for Industrial Controls: IEEE-74
    - 2.6.10 Master Test Code for Resistance Measurement: IEEE-118
    - 2.6.11 Master Test Code for Electrical Measurement in Power Circuits: IEEE-120.



- 2.6.12 Dynamic Response Testing of Process Control Instrumentation: ISA-S26.
- 3.0 EXECUTION:
- 3.1 Protection: Take precautions to prevent injury to personnel and to avoid damage to equipment and other property in compliance with ANSI C2.
- 3.2 Power Supplies that may be a hazard during the performance of the work shall be locked out.
- 3.3 Testing: Check the operation of each instrument after it is returned to service. Adjust each instrument to operate properly over the design range.
- 3.4 Report: A final report shall be prepared after the maintenance, repair, or replacement has been accomplished. A list of all equipment worked on, the service performed on each piece of equipment, and calibration data shall be included in the report. the report shall be typed and furnished to the Contracting Officer.
- 2.1.19.5 Turning the remote switch for the Relay Control panel on or off shall activate the digital communicator and transmit closed or open signals, respectively.
- 2.1.19.6 When the ultrasonic and /or infrared control panels are in the on position, the magnetic switches and other sensors in the closed position and the remote switch is turned to the on position, the system is now in the "armed" condition. Movement detected by either the transmitters, receivers, transceivers, or opening a magnetic contact switch, shall activate the strobe light and/or sirens depending on the position of their respective cut-off switches. In addition, the outputs of the relay control panel shall activate the digital communicator which will transmit the location and alarm code to the Central Station receiver.
- 2.1.19.7 The alarm device that are activated shall operate for not less than three (3) nor for more than fifteen (15) minutes. After that time, the system shall reset and if all transmitters, receivers, transceivers, magnetic switches and other sensors are in the closed position the system shall be "armed" against further intrusions. An open in any of the sensing devices shall cause the system to again go into alarm.
- 2.1.19.8 Where the entrance and exit delay is specified:
- A. For exiting from the building: The zones connected into the entrance/exit delay zone shall not be capable of initiating an alarm until the specified time period after the remote switch has been turned to the "on" position. Movement detected by other motion detectors or sensors shall initiate an alarm immediately during the delay period. The delayed zones shall be "armed" to detect intruders after the delay period has ended.
  - B. For entrance to the building: Entering the building at locations that result in movement in the presence of motion detectors or opening sensor(s) before the remote switch is turned to the "off" position shall cause an immediate alarm condition. Entering the building at a location that "breaks" the delayed zones shall immediately activate the Remote Switch Buzzer. However, operation of the remaining alarm devices and digital communicator shall be delayed for a specified time period. If the remote switch is not turned to the "off" position before the delay period has ended, the alarm devices and digital communicator shall be activated.
- 2.1.20 General Operating Instructions
- 2.1.20.1 Arming the System (Exiting at Night)



## 16000 - Electrical

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- A. OPEN the key station box and OBSERVE A BLINKING RED LIGHT
- B. PUNCH in the proper four (4) digit code.
- C. BLINKING RED LIGHT BECOMES STEADY LIGHT
- D. SYSTEM IS NOW ACTIVE

NOTE: If no blinking light is observed - this indicates that one of the detectors or door contacts is "OPEN". Go to the alarm control panel #1034 and determine the open zone. A red light on the 4 zone panel indicates the location.

Correct the problem by checking the zone (closing door, etc.) Make sure no one is walking within the zone area. IF TROUBLE CANNOT BE LOCATED - BYPASS THIS ZONE BY MOVING THE SWITCH OVER THE ZONE LIGHT INTO THE OFF POSITION.

Now exit using the procedure outlines above.

### 2.1.20.2 Disarming the System (Entering in the Morning)

- A. IMMEDIATELY after entering in the morning, punch in the four digit code.
- B. The RED LIGHT will go out and then start to BLINK. If the light does not begin to BLINK a few seconds after the code has been the punched, the system has been activated during the night.
- C. IMMEDIATELY: (1) Enter the four digit code to turn the system red light. (2) Re-enter the four digit code - the red light will go out and then start to blink.
- D. THE SYSTEM IS NOW CLEARED.

NOTE: The above instructions are for the Ademco 1023 alarm control. Use of other specified equipment will modify these instructions. Contractor shall be responsible to provide accurate instructions to building custodial personnel when other specified equipment is used.

## 2.2 General Conditions

### 2.2.1 Workmanship

- 2.2.1.1 All wiring terminations in relay control panel, zone expanders, ultrasonic panels, and digital communicators shall be made with insulated spade lugs (sta-cons).
- 2.2.1.2 Wiring inside all panels shall be routed neatly in corner and tied with cable straps.
- 2.2.1.3 Add on modules inside relay control panel shall be permanently mounted on panel without interfering with wiring or other related equipment.
- 2.2.1.4 Round fiber tags marked in black ink shall be tied around wiring inside relay panel without interfering with wiring or other related equipment.

### 2.2.2 Requirements

- 2.2.2.1 All control panels, relay control, ultrasonic master control panels, locked box for digipad, and related cabinets with key lock, except digital communicator shall be keyed alike using Corpus Christi Army Depot lock set for 1393 keys. Contractor is responsible for assuring lock sets utilize Corpus Christi Army Depot 1393 key.



- 2.2.2.2 Digital communicator lock set shall be for Corpus Christi Army Depot #650.
- 2.2.2.3 Contractor shall identify last Detection Device in each zone containing end of line resistor. This shall apply to branch circuits within a zone.
- 2.2.2.4 Locked box for digipad Remote switch and memory controls shall be equal to Hoffman Engineering Company, small Nema type 1 enclosure #A-8N64 8" x 6" x 4" or larger. Cylinder lock set and key shall be 1393 key. See elsewhere in specification for number of memory controls to be installed.
- 2.2.2.5 Contractor shall provide directory in glass frame adjacent to alarm controls. Director shall list "Area Covered," "Infrared Zone" and "Zone Expander Zone" for each separate zone specified.
- 2.2.2.6 Contractor shall furnish a rise diagram approx. 9" x 12" in frame with glass cover mounted adjacent to alarm controls. Riser diagram shall be made with straight edge ruled lines and indicate location of sensors and routing of wiring. End of line resistor shall be clearly indicated on rise diagram.
- 2.2.2 General
- 2.2.2.1 The Electrical Contractor shall furnish, install all items of equipment indicated on drawings, or hereinafter specified to equip the building with an ultrasonic security system, along with associated conduit, wire outlet boxes and mounting hardware.
- 2.2.2.2 The Contractor shall submit engineered drawings of the proposed layout.
- 2.2.3 Multi-Zone Control Panel
- 2.2.3.1 This multi-zone unit consists of one circuit board and four processing circuit boards enclosed on one control cabinet. The front of the cabinet shall contain a windowed front which shall give the status of transmitter and received lines, AC power, client controlled walk test and relay annunciation, all with the cabinet locked and secured.
- Each circuit board shall represent a zone, for a total of five zones per unit. This unit shall be 5Z-2001-L system, Sontrix or an approved equal.
- 2.2.3.2 The circuit board shall be the ASP-2001-L, Sontrix Mfg. Co., or an approved equal. ASP-2001-L contains the following features:
- A. Built-in annunciator
  - B. Line supervision
  - C. System is secured through the end of line resistors or transducer and transceiver lines.
  - D. Protection against system tampering during the systems "ON" and "OFF" periods.
  - E. Transducer line fault indicating lights show which line has been tampered with.
  - F. A 15-second timed Sonalert indicated loss of AC power.
  - G. Reset button, inside locked cabinet will not reset the system until the fault has been corrected.
- 2.2.3.3 The multi-zone unit which contains in addition to the circuit board, four processing boards which contain the following features:



## 16000 - Electrical

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- A. Each processing board has a double set of relay contacts. The second set can be used to activate a "Lock Up" Annunciator Panel. Each board has its own latching annunciator and all are reset by the button on the circuit board.
- B. Each board has both receiver and transmitter terminals. The transmitter is routed internally to each section. This makes multiple transmitter runs easier by providing more terminals. It also permits soning of the line supervision.
- C. Each processing board shall be the equal of Sontrix, Model 5Z-2001-L or an approved equal.

### 2.2.4 Master Control Panel

Master control panel shall consist of one Ademco 1023 main relay panel complete with rechargeable power supply and (2) Ademco 1034 four zone expander units with switches numbered 1 to 8.

Master panel shall have alarm device outputs. Each zone of zone expander shall have a separate output. Panel shall be modified as required to include the following:

- 2.2.4.1 Automatic mechanical counter which shall register the number of times the system is triggered into alarm condition. The counter shall be non-resettable and have a minimum of three digits and be visible when the panel door is closed.
- 2.2.4.2 N.O. dry contacts (normally open).
- 2.2.4.3 12 volt power supply for operation of alarm devices.
- 2.2.4.4 Three (3) spare keys for control panel.

### 2.2.5 Remote Switch

Type A Remote Switch to be the equal of Ademco, Catalogue 246 with two-wire remote station adapter equal to Ademco Catalogue 245 installed in relay control panel.

### 2.2.6 Digital Communicator

Digital communicator shall be capable of being utilized as a slave or eight-zone control panel and capable of dialing out on two separate phone lines. Communicator shall have eight (8) distinct alarm channels and separate and distinct codes for opening and closing. Digital communicator shall simultaneously transmit multiple alarms with priority override.

### 2.2.7 Transformers and Power Supplies

Transformers and power supplies for relay control panel, ultrasonic panel, digital communicators and alarm devices shall be installed in a hinged metal at location specified. Unless otherwise specified, transformer for ultrasonic panel shall be 120V/16VAC, 20 VA and transformer for digital communicator shall be 120V/16VAC, 20 VA. All other transformers and power supplies shall be as specified elsewhere in this specification. Contractor may at his option install multi-voltage transformer of sufficient rating complete with fused terminal strip for power to each panel and alarm device.

### 2.2.8 Transceiver

Transceiver is a wall mounted unit with adjustable transducers within the unit so as to be able to adapt to any environmental situation.



Sensitivity of the unit may be checked by the built-in walk test LED the walk test LED also monitors the AC power connection since it will not light if the AC fails.

Unit is powered from a low voltage plug-in transformer. The unit will automatically switch to a built-in rechargeable battery in the event of a power failure. Standby time is 12 hours.

Long Range Transceiver shall be Ademco, Catalog #TR-66 or approved equal. (6' x 70')

Broad range transceiver shall be Ademco, Catalog #TR-6 or approved equal. (35' x 25')

2.2.9 "Blaster" Electronic Siren

Unit shall consist of a speaker and tamper switches in cabinet plus driver module.

Unit shall be 12 volt powered and furnished with an automatic alarm cut off which shall cut off "BLASTER" in 15 minutes after alarm.

Speaker are weather resistant.

Unit shall be Ademco, Catalog #717 or approved equal.

2.2.10 Electronic Howler Siren

This device shall be weather resistant 12 volt electronic Howler siren in outdoor box and complete with driver module as per Ademco Catalog #711-712 or approved equal.

2.2.11 Strobe Light

Alarm device shall be flashing strobe light, 1,000,000 CP, clear, 60 per minute flash rate operable on 12 volt DC, surface mounted type, weather proof, device shall be Ademco, catalog #711 or approved equal.

2.2.12 Digital Keypad (Keyless) Arming and Disarming

Digital keypad shall be mounted in a surface mounted box with a key lock drop, at location shown.

Digital keypad is a two component system consisting of a keypad and adapter. Adapter shall be located in the control panel.

Digital keypad is a two component system consisting of a keypad and adapter. Adapter shall be located in the control panel.

Digital keypad shall be Ademco, Catalog #215 or approved equal.

Adapter shall be Ademco, Catalog #216 or approved equal.

2.2.13 Wiring Installation

2.2.13.1 Lateral runs of low voltage wires and shielded cable shall be installed concealed in ALL areas of hung ceilings.

2.2.13.2 Later runs in rooms and areas without hung ceilings except as otherwise specified, shall be installed in rigid metal conduit.

2.2.13.3 All vertical wiring and wiring in lobbies, stairwells, entrances, vestibules or on exterior of building shall be installed in raceway. Raceway or exterior of building shall be 1/2" rigid conduit. Surface metal raceway and rigid conduit installations shall conform to the requirements of the Electrical Standard.



## 16000 - Electrical

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2.2.13.4 All wiring at locations, where asbestos ceilings or wall have been encapsulated, shall be installed in raceway along wall just below ceiling line. Sensing units in these locations shall be installed, mounted on wall below ceiling. Wiring and sensors specified for areas with encapsulated asbestos walls shall be installed so as not to penetrate the asbestos material.

### 2.2.14 Types of Wiring

2.2.14.1 Wiring specified hereinafter as "No. 18 twisted pair", shall be unshielded #18 AWG, copper, vinyl insulated twisted pair, vinyl jacket. UL listed, Belden Trade No. 8461 or approved equal.

2.2.14.2 Wiring specified herein after as "shielded cable" shall be shield type 18 AWG, copper, vinyl insulated twisted pair, aluminum polyester-shield, turned copper drain wire, vinyl jacket, UL Listed, Belden Trade No. 8760 or approved equal.

### 2.2.15 Operation

Upon completion of all installation and wiring, the new alarm system shall be capable of performing as follows:

2.2.15.1 With a remote control station and/or master control panel in the off or day position and all sensors in respective zones in closed position, while light on remote switch or access light on control panel shall be lit. An open in any of the sensors shall extinguish the lights.

2.2.15.2 OFF switch on ultrasonic control panel shall render all transmitters inoperative.

2.2.15.3 When the switch on the ultrasonic control panel is in the Test position, motion detected in area of transmitter and receiver shall cause the audible device and light on the remote control unit to operate. No other alarm devices or central station shall operate.

2.2.15.4 Zone switches on relay control panel shall be capable of placing sensors in respective area in the "secure" and "access" position.

2.2.15.5 Turning the remote switch and/or main relay control panel switch, on and off, shall activate the digital communicator and transmit closed and open signals respectively.

2.2.15.6 When the ultrasonic control panel is in the "on" position, the ultrasonic sensors in the closed position and the remote switch or relay panel switch is turned to the "on" position, the system is now in the "armed" condition.

2.2.15.7 The alarm devices that are activated shall operate for not less than three (3) nor more than fifteen (15) minutes. After that time, the system shall reset as if all transmitters, receivers, transceivers and sensors are in the closed position by "armed" against further instructions. An open in any of the sensing devices shall cause the system to go again into alarm.

2.2.15.8 For exiting from the building, the zones connected into the entrance/exit delay module shall not be capable of initiating an alarm until the specified time period after the remote switch has been turned to the "on" position. Movement detected by other motion detectors or sensors shall initiate an alarm immediately during the delay period. The delay zones shall "armed" to detect intruders after the delay period has ended.

2.2.15.9 For entrance to the building: Entering the building at locations that result in movement in the presence of motion detectors or opening sensor before the remote control station is turned to the "off" position shall cause an immediate alarm condition. Entering the building at a location that "breaks" the delayed





zone shall immediately activate the mini-howler. However, operation of the remaining alarm devices digital communicator shall be delayed for a specified time period. If the remote switch is not turned on "off" position before the delay period has ended the alarm devices and digital communicator shall be activated.

### 2.2.16 Central Station Connection Box

The Electrical Contractor shall furnish, install and connect two normally open contacts in separate outlet box which shall be located adjacent to the multi-zone control panel.

The Electrical Contractor shall furnish, install and connect four, number 14 conductors in conduit from the multi-zone panel to this outlet box.

### 2.2.17 Performance Tests

2.2.17.1 Prior to purchasing the equipment herein specified, this Contractor shall submit for approval data on items listed above, from an approved testing laboratory not connected with the manufacture of the equipment. The data shall certify that the performance of the equipment to be installed meets the requirements of the specification, and that the equipment, installed is equal to, or better than that specified. Such tests shall be made under conditions which, in the opinion of the Engineer, simulate conditions of actual use in the building.

2.2.17.2 The data to be submitted shall include full and complete information, regarding all performance characteristics, which shall be deemed necessary and sufficient in the operation of the Contracting Officer..

### 2.2.18 Service Data

2.2.18.1 Furnish and deliver seven (7) copies of the following maintenance and service information.

- A. Detailed Riser Diagram showing wiring, relays, control panels, transmitters, receivers, magnetic contact switches, etc., with locations indicated.
- B. Complete service manual showing operating maintenance and troubleshooting procedures of new security system.
- C. The four (4) copies shall be distributed as follows:
- D. Two (2) copies to the Building Custodian Engineer.
- E. Submit two (2) copies of printed procedures for operation of the total system and detailed riser diagram showing wiring, relay location of equipment to the Contracting Officer.
- F. Furnish a written guarantee for security system for a period of one (1) year. During this period the contractor shall keep a system operating properly, replace parts and make adjustments as required at no cost to the Contracting Officer, except where this work is the result of obvious misuse or vandalism. Guarantee period shall start from date of final acceptance.
- G. Receipts for spare keys, instructions, manuals, etc., signed by the custodian and the written guarantee shall be submitted with final payment requests.

### 2.2.19 System Test

2.2.19.1 The contractor shall upon completion of the system adjust sensitivity of detectors so as to provide a system operating at maximum capability and effectiveness.



## 16000 - Electrical

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2.2.19.2 The owner may direct, at such time, that the Contractor perform an operating test for approval. The equipment shall be demonstrated to operate in accordance with the requirements of these specifications.

### 2.2.20 Guarantee

The Electrical Contractor shall present before final payment for this system a certified statement by the manufacturer or his agent that he has generally supervised the installation and the test of the system on completion of the work. That he will warrant the system for one year after date of acceptance by adjusting or replacing defective material, workmanship or equipment.

### 2.3 Sound and User Activated Security System

#### 2.3.1 Performance Tests

Where this Contractor elects to furnish equipment on a particular project other than that specified in this section, he shall request approval of the Contracting Officer in writing and receive that approval, if granted, prior to submission of Shop Drawings on that particular project. The Contractor shall be required to submit these approval requests sufficiently in advance so that the approval process will not delay the project. The Contractor or his supplier shall submit with his request technical data on the performance characteristics of the equipment being offered. This data shall certify that the performance of the equipment being offered meets the requirements of the specification and that the equipment being offered is equal to or better than that specified and that the equipment being offered to equal to or better than specified. the Contracting Officer may request that tests be conducted by the Contractor or his supplier, and may even require that these tests be conducted by an approved independent testing laboratory. Such tests shall be made under conditions which in the opinion of the Contracting Officer, simulate conditions of actual use in the building. This Contractor or his supplier shall include the costs of these tests and submissions as part of the contract where he first chooses to use this new equipment.

The data to be submitted shall include full and complete information regarding all performance characteristics which shall be deemed necessary and sufficient in the opinion of the Contracting Officer,.

Where an Architect/Engineer of records amends these specifications in a substantial manner on his particular project, the above requirements for performance tests shall apply except that the Contractor and his supplier shall submit for approval to that Architect/Engineer in lieu of the Contracting Officer and obtain approval from that Architect/Engineer of record.

#### 2.3.2 General

##### 2.3.2.1 Sound System

###### A. Sound and Program System

Furnish and install all items of equipment indicated on the Drawings or hereinafter specified, or required to equip the building with a Sound System.

The Sound System shall be a three channel system which shall reproduce speech and music from radio, turntable and microphone at any or all loudspeakers over either of two main program channels. The third channel shall be an intercom channel which shall permit two way



conversation between the rack or administrative telephones and each loudspeaker and shall permit listening-in at any area under the control of the area user by means of a privacy switch.

The Sound System shall also be designed to automatically reproduced at pre-selected loudspeakers a suitable tone for purposes of program signaling. Control of the Sound System for such program signaling shall be from the Program Instrument described in Section 16-10, "Electric Clock Equipment".

B. Local Sound Systems

When so indicated on the Drawings or in the Amendments, furnish and install all items of equipment indicated on the Drawings, described in the Specifications or required to equip the respective areas with the sound systems indicated:

1. An Auditorium Sound System - complete with local amplifier mounted in a cabinet at location shown on drawings.
2. A Cafeteria Sound System - complete with local amplifier mounted in a cabinet in the Cafeteria.
3. A Gymnasium Sound System for Each Gymnasium. This sound system shall be complete with a local amplifier mounted in a cabinet in each Gymnasium.
4. An Assembly Area Sound System - complete with local amplifier mounted in a cabinet in the Assembly Area.

THE AUDITORIUM, GYMNASIUM, CAFETERIA AND ASSEMBLY AREA SOUND SYSTEMS, shall reproduce speech and music from microphones and turntables through their respective loudspeakers, and each system shall be so interconnected with the sound system that the auditorium, assembly area, gymnastic and cafeteria speakers may be fed from controlled by the Central Control Rack and that program signaling from the Central Control Rack will be delivered to each speaker in each of these areas.

The Auditorium and Assembly Area Sound Systems shall also be so interconnected with the sound system that the output of these systems may be fed into the sound systems may be fed into the sound system through their respective amplifiers as hereinafter described.

All systems shall be capable faithfully reproducing sound over the range of frequencies hereinafter described.

C. General Requirements

All equipment shall be complete in all respects with all connections made and shall operate in accordance with the specifications to the satisfaction of the Contracting Officer.

All equipment shall be designed for operation on the type of current and the voltage available at the building, which is usually from a nominal 120 volt, 60 Hz, single phase power source. This Contractor shall contact the Lighting Company, to determine the character of the current to be supplied and shall transmit this information to the manufacturer of the sound system so that the proper equipment will be supplied.

Extraneous noises developed by the system as installed in the building shall not be perceptible when the system is operating 6 db (sound volume) above the average operating volume level of the sound system.



## 16000 - Electrical

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The sound equipment shall be the product of approved manufacturers acceptable to the Contracting Officer.

Since dimensions of sound equipment vary for the different manufacturers, dimensions of all equipment shall be subject to the approval of the Contracting Officer. It shall be the obligation of this Contractor to verify space limitations before ordering equipment. The Contractor shall submit to the Contracting Officer a list of all equipment to be furnished, stating manufacture, type, special characteristics, dimensions, etc.

### D. Acceptable Manufacturers

Acceptable manufacturers of sound equipment are Altec-Lansing Co., Rauland-Borg Co., Stromberg Carlson Co., Dukane Corporation and David Bogen Company. All equipment shall be the products of the aforementioned companies or the equal in performance of other manufacturers of sound equipment which meet the Specifications and are acceptable to the Contracting Officer.

### 2.3.2.2 Sound Motion Picture System

Furnish and install all conduits, conductors, receptacles, etc., indicated on the Drawings, in the Specifications or required to provide a wiring system to be used for at 16 mm sound motion picture projector in the Auditorium or Assembly Area.

The projector will be furnished and installed by the Contracting Officer and is NOT part of this Contract.

### 2.3.2.3 Intercom and User Activated Security System Administrative Telephone Communications System

Furnish and install an Administrative Telephone Communication System incorporated with the intercom channel of the Sound System. This system shall have the following features and functions:

- A. Direct dialing, two-way (via touch-tone push buttons) telephone communications between all administrative telephones; and between administrative telephones and between administrative telephones and intercom telephones (where intercom telephones are part of this system).
- B. Direct dialing, two-way "amplified voice" communications between all administrative telephones and staff loudspeakers or staff telephones.
- C. Automatic level control to assure a predetermined constant return-speech level.
- D. Facilities for automatically sounding a warning tone signal over any loudspeaker selected for two-way "amplified voice" communication. The warning tone signal shall sound as soon as the station is selected and shall be automatically repeated at regular intervals for the duration of the call.
- E. Capability for any administrative telephone to transfer a call from any administrative telephone, staff telephone, intercom telephone to another telephone, and to transfer calls from any loudspeaker station to any administrative telephone or intercom telephone.
- F. Facilities for conference calls between administrative telephones and between administrative telephones and staff telephones (and loudspeakers) using any administrative telephone to establish the conference.



- G. Facilities for the instantaneous distribution of emergency announcements simultaneously to all loudspeakers by dialing a predetermined code number. Emergency announcements originating at any administrative telephone shall priority over all regular system functions (even if the audio-distribution center is turned off), and shall be transmitted at a predetermined level.
- H. Built-in facilities for a minimum of ten (10) administrative telephones and two hundred (200) staff loudspeaker stations. At least four (4) of the administrative telephone locations shall be capable of visual displays.
- I. Facilities for the origination of both "Normal" and "Priority" calls from any staff station. Normal call origination shall require only a momentary depression of the call-switch (or where telephones are used, by lifting the telephone from its cradle). This action shall sound a chime signal to alert personnel in the General Office to the call and register the call on a digital display. Priority (Emergency) calls shall have precedence over all normal calls and shall be originated by "Flashing" the call origination switch (or flashing the telephone cradle switch).
- J. Digital readout display shall be provided with each administrative telephone (Maximum of four). The display system shall visually display in the order in which they are received, at least the first three (3) calls received and "Store" seven (7) more calls or a total of ten (10) in the memory circuit. Priority (Emergency) calls shall have precedence order all normal calls and shall not be immediately displayed and identified by "Flashing" their number. The incoming call is answered. The number that is flashing shall be the actual room numbers. (Architectural dialing.)
- K. Facilities for answering calls registered in the readout system in the order in which they are received by pressing a single "response" button.
- L. A "busy" light on the face of each administrative telephone which lights whenever is busy.
- M. Provisions for coded signaling from one administrative telephone to another administrative telephone.
- N. Facilities to prevent monitoring of any staff station whose call origination switch is in the "private" mode.
- O. Facilities for the use of staff telephones for communications without interruption of normal programming, or the distribution of time or alarm signals.
- P. Facilities for the distribution of a program signal to selected speakers at specified time intervals. This action shall be controlled by the operation of a program clock, which may be external to this system or part of this system as specified.
- Q. Provisions for sounding a momentary warning tone every ten (10) seconds when an administrative phone is picked up to supervise a conversation in progress.
- R. Facilities for two-way communications between any staff loudspeaker and any other staff loudspeaker.
- S. Ability to use any telephone as an "announcement microphone" permitting the telephone to be used for local sound reinforcement.
- T. Facility for the distribution of alarm signals to all areas equipped with loudspeakers by push button dialing of predetermined code numbers. This is to be accomplished even if the audio



## 16000 - Electrical

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distribution center is turned off. Three separate, distinct alarm signals shall be provided with each having a separate dial code number.

- U. The Administrative Telephone Communications System shall be the equal of Rauland Telecenter III/Telecenter I or DuKane System of 1200/PAX modified as required to meet the above listed performance features and functions.

### 2.3.2.4 Approval by Underwriters Laboratories, Inc.

All amplifiers and radio tuners shall be approved by the Underwriters Laboratories Inc. and shall bear their seal of approval.

### 2.3.2.4 Optional Inclusion of Interior (Intercom) Telephone System as Part of Sound System

At the discretion of the Contracting Officer the Contractor is permitted to include the Interior (Intercom) Telephone System as part of this system where the contract plans and specifications require him to provide a separate Interior (Intercom) Telephone System. This Contractor at his option may furnish either separate Sound/ Security and Interior Telephone Systems as specified or a combined system. The combined option system shall have the following features in addition to those specified in A, B, and C above.

- A. Interior (Intercom) dial telephones shall be capable of dialing and communicating with each administrative telephone and every other interior dial telephone automatically.
- B. Interior (Intercom) dial telephones shall be capable of contacting staff stations (loudspeakers or telephones) through the administrative telephones.
- C. System shall permit the same number of simultaneous separate conversations between Interior dial telephones as required of the Telephone Exchange Unit in Section 16-11. This total number shall be held to a maximum of ten and shall not include the conversation path furnished normally with the administrative telephone system.
- D. All exchange equipment shall be included as part of the Central Control Rack and this Contractor shall furnish and install additional conduit and wiring as required to route all telephone lines from the Telephone Exchange Location to the Central Control Rack.
- E. The exchange equipment in the Central Control Rack shall automatically disconnect from the exchange any telephone which is taken "off the hook" where dialing has not commenced within fifteen (15) seconds.
- F. The Contractor shall omit the interior (intercom) telephone on all desks where one is installed adjacent to an administrative telephone and all "tel lines" to these omitted telephones. Only one telephone shall be omitted however in the General Office Area. This omission is permitted in this option since the administrative telephone at the same desk is capable of performing all the activities of the interior dial telephone.
- G. The system shall be the approved equal of a modified Raulang-Borg combination of Telecenter I and Telecenter III, modified as required to meet all the above and hereafter requirements.

### 2.3.3 Central Control Rack

#### 2.3.3.1 General



Furnish and install a Central Control Rack at the location indicated on the drawings. The equipment hereinafter described shall be mounted in once, two or three cabinets as required, in an arrangement satisfactory to the Contracting Officer. All equipment shall be rigidly supported by the steel framework of the cabinet in an approved manner. Method of mounting equipment shall be submitted for approval before fabrication of Central Control Rack.

### 2.3.3.2 Cabinet

Each cabinet shall be approximately 84" high x 22" wide x 15" deep. If another size is used, it shall be approved by the Contracting Officer. Top and sides of cabinet shall be of steel not less than 12 gauge.

Panel mounting angle irons shall be not less than 3/16" thick, with mounting holes accurately drilled and tapped 12/24" thread on multiple 1-1/4" - 1-1/2" spacing. All screws for panel mounting, angle mounting, etc., shall be concealed by means of full length trim at corners, sides and front. Corner trims shall be rounded.

Rear of cabinet shall be equipped with a cold rolled steel door of same thickness as cabinet, containing suitable ventilating grilles at top and bottom. The door shall be hung from 3 sturdy, loose jointed steel hinges attached to flange at rear of cabinet. Door shall have bent up return edge and shall close against a concealed rabbet at top, bottom and side of door openings. Door shall be equipped with an approved handle and a Yale 511-S lock with a #47 key change.

Rear door of cabinet in Sound Control Closet shall have approved combination handle and catch.

Equipment shall be either shelf-mounted or frame-mounted. Panel mounting of heavy equipment will not be permitted.

Angle irons shall be installed in an approved manner to rigidly support heavy equipment not support by shelves. Sufficient space shall be left at side and rear of shelves for installation of rack wiring.

Suitably rust-proofed and finished cold roll formed steel panels not less than 16 gauge, if properly braced, or aluminum panels not less than 1/8-inch thick, shall be secured to the front panel mounting angles by means of round oval head steel screws. Control equipment hereinafter described shall be mounted on panel front.

The bottom of the rack shall be equipped with suitable openings for admitting external circuit conductors. Any additional openings in sides of cabinet shall be neatly cut by this Contractor. Cabinets and panels shall be spray painted with one coat of high bake oil primer and one smooth coat of slat gray enamel. Trim shall be of gray enamel to match.

Where the cabinet is installed in closet, a suitable L-shaped trim shall be provided to close the space between the rack and the door frame. Trim shall have a gray finish to match rack panel. Trim shall be fastened to front of rack and door frame. Trim shall be installed in accordance with directions of the Contracting Officer's electrical representative at the site.

Where the Central Control Rack is installed in a framed opening of a wall, this contractor shall furnish and install a suitable L-shaped trim on both sides of the opening to close the space between the rack and the opening. This trim shall be specified above for a closet installation.





## 16000 - Electrical

Where the Central Control Rack is required by the plans, specifications, or amendments to be installed in one cabinet in a closet and one cabinet is insufficient to house all components, this contractor shall offer alternate proposals for component arrangement to the engineer/architect of record for approval.

Components may be mounted in wall hung enclosures either within the closet or immediately outside the closet. All additional enclosures, conduit, wiring required by these alternate proposals shall be furnished and installed by this contractor as part of this contract.

2.3.3.3 Components: The Central Control Rack shall contain, but not be limited to the following:

1. Central Switching Exchange shall be similar to Rauland RT2002 and TAC 100 Expander or Dukane 9A1716 and expander panels or approved equal. Furnish and install a central switching exchange designed for use with dual-tone modulation type pushbutton dialing telephones. The exchange shall be an electronic switching type utilizing all solid state, logic and control circuits. It shall provide 3 wire balanced transmission complete with dial tone, ringing buy signal and conference call facilities. The exchange shall consist of the following components:
  - a. Microprocessor Panel - This panel shall be completely solid state computer, capable of processing call information from Administrative Telephones and either completing the call or adding to the call waiting list. The processor shall maintain a call waiting list of up to 100 calls, and shall display the number of the first call on the list and the number of calls waiting on the list on digital readouts associated with Administrative Telephones.
  - b. Autotrol Panel - This panel shall provide hands free, two way voice amplification between a telephone handset and a loudspeaker. All switching shall be done electronically, and the amplifier shall be rated at 15 watts with less than 5% distortion within the voice tailored frequency range. Pre-set level controls shall eliminate the need for either of the participants in the conversation to adjust a volume control.
  - c. Multiplexer Panel - This panel shall monitor the room stations to determine if a room is signaling a call, and to determine the level of the call, if one is present. When the multiplexer panel has decoded a call and determined the level of the call to the waiting list. A typical time interval for checking all roomstations in the system shall be 100 milli-seconds.
  - d. Multifunction Panel - This panel shall provide tone generation at the direction of the Administrative Telephones, provide amplifier gathering for zone or All-Call paging at the direction of the microprocessor panel, and provide control signals to the selector switch banks for Time Program Signaling.

The exchange shall have the following features:

- a. The central exchange shall have built in switching and control facilities for a minimum of one hundred (100) staff station lines and ten (10) administrative lines, plus facilities for accommodating a minimum of ten (10) special functions. The exchange shall be increased by the addition of an expander unit with provisions for an additional one hundred (100) staff station lines for a total of two hundred (200) lines.
- b. The exchange shall also include a bi-directional voice controlled amplifier for two way communications between telephones and loudspeakers without the need of a talk-listen switch.





- c. The exchange shall be capable of receiving, calls from one hundred (100) stations and displaying their staff members on the associated digital displays.  
These staff numbers shall be the actual room numbers.
- d. The voice controlled amplifier shall have an output of at least 5 watt RMS and shall include built in volume compressor so as to eliminate the need for volume controls and facilities for sounding tone signals over any loudspeaker selected for communication.
- e. The incoming call circuitry shall be of the integrated circuit (IC) type using logic design for functions and memory.
- f. The exchange shall also include all the circuitry required for operation of staff stations and the generation and distribution of signals and alarms.
- g. It shall be of modular design utilizing plug-in printed circuit boards with support channels for each board. The boards will be UL approved.
- h. The exchange shall be for rack mounting in any standard 19-inch rack and shall have a depth no greater than 13 inches and require no more than 14-inches of panel space.

2. DC Regulated Power Supply

The power supply shall be DuKane, model 17A365 Rauland PXC30 or approved equal.

Power Supply shall furnish 24 volts DC at 3.2 amperes. The supply shall operate on 105 to 125 volts AC by use of primary transformer taps. The input shall be protected by a 2 ampere and a 3 ampere fuse.

The output shall be protected by an electronic fold back circuit and a 3.2 ampere resettable circuit breaker. The fold back circuit shall be self restoring when the overload or short condition is removed.

Power supply be light gray with black trim. External connections shall be screw terminals.

3. AM-FM Tuner

The AM-Fm tuner shall be a Rauland (SRX143) or approved equal, designed specifically for continuous duty service.

It shall be completely solid-state, including transistors and integrated circuits for reduced power consumption and greater reliability and life expectancy. Tuners using tubes (which require frequent replacement), will not be accepted.

The AM portion shall have a tuning range of 540 to 1600 kHz, a sensitivity of at least 3 microvolts for 6 dB signal-to-noise ratio, and an adjacent channel selectivity of at least 40 dB. Image rejection, measured at 600 kHz shall be 96 dB, and if rejection shall be at least 75 dB. The AM section shall include an antenna matching coil, and screw terminals shall be provided for connection of an external AM antenna.

The FM section shall have a tuning range of 88 to 108 MHz, with alternate channel selectivity of 75 dB, a sensitivity of at least 1.5 microvolts for 20 dB quieting, and 6 dB band-width of at least 400 kHz. Image rejection measured at 88 MHz shall be at least 90 dB, and if rejection measured at 88 MHz shall be at least 81 dB. The tuner shall also incorporate a switchable



## 16000 - Electrical

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muting circuit to quiet noise between stations on FM. Screw terminals for the connection of either 75 or 300 ohm external antenna shall also be provided.

The FM frequency response shall be at least  $\pm 2$  dB from 20 to 15,000 Hz, with distortion of less than 0.5% at rated output.

The tuner shall be equipped with an illuminated slide-rule dial employing a weighted flywheel and gear-drive tuning capacitor for smooth tuning. An illuminated peak tuning meter shall be provided for precise "on-station" adjustment of both AM and FM stations.

The tuner shall require no more than 3-1/2" high, 19-inches wide and shall be no more than 8" deep. The face panel shall be tinted brushed chrome with a wear-resistant protective top coat.

The tuner shall meet FCC radiation requirements and be listed by the Underwriters' Laboratories Re-examination Service.

The dial of the tuner shall be plainly marked by an easily distinguishable line at the proper tuning position for best reception of Radio Station WLRN, and this position shall be plainly labeled "WLRN".

### 4. Channel "A"

Control Panel - This panel provides a built-in Panel microphone, all Room or Selected Room transmit buttons, remote emergency operation, remote volume control capability and automatic output level control. Panel shall be Rauland, Model MC1-200, DuKane Model #9A1665 or approved equal.

This panel shall be a visual flow panel with illuminated push buttons color keyed to the color coded operational guideline and shall be completely solid state.

Panel shall be 3-1/2-inches high, 19-inches wide and 8-inches deep. Front Panel shall be finished with a gray, baked enamel with charcoal brown overlay bearing yellow operational guidelines.

Furnish and install an input expander panel with this control panel. Expander panel shall be DuKane, Catalog #2A65 or approved equal.

Input selector buttons or 19 position selector switch shall be provided for each microphone input and Zero Level Input with at least 20% spare positions.

### Pre-Amplifier

A voltage pre-amplifier shall be provided for each channel to provide voltage amplification for each of these separate and distinct channel. Each pre-amplifier shall be securely mounted on the Master Control Panel.

The program pre-amplifier shall have an output rating of 1.5 volts into 10,000 ohms at less than 1% distortion from 40 to 15,000 Hz. Frequency response shall be flat within  $\pm 2$  dB over this range. Microphone inputs shall be 47K ohms unbalanced, convertible to balanced 150 ohms. Auxiliary inputs shall be 500K ohms unbalanced with 0.25 volt sensitivity. A rear mounted treble control shall be provided. Pre-amplifier provides a minimum of five program inputs (two microphones, one tuner-player, two auxiliary) each selected by fluorescent color display push-button.



5. Channel "B"

Control Panel - This panel shall be completely solid state and shall provide automatic output level control. The panel shall be visual flow panel with illuminated pushbuttons color keyed to the color coded operation guidelines. This panel shall be used in conjunction with Channel A Master Control Panel.

Panel shall be 3/4-inches high, 19-inches wide and 8-inches deep. The front panel shall be finished with gray, baked enamel with charcoal brown overlay bearing green operational guidelines.

Panel shall be Rauland, Model MCB-200, DuKane model 9A1670 or approved equal.

Furnish and install an input expander panel with this control panel. Expander panel shall be DuKane, catalog #2A65 or approved equal. Input selector buttons or 19 position selector switch shall be provided for each microphone input and zero level input with at least 20% spare positions.

Pre-Amplifier

A voltage pre-amplifier shall be provided for each channel to provide voltage amplification for each of these separate and distinct channel. Each pre-amplifier shall be securely mounted on the Master Control Panel.

The program pre-amplifier shall have an output rating of 1.5 volts into 10,000 ohms at less than 1% distortion from 40 to 15,000 Hz. Frequency response shall be flat within  $\pm 2$  db over this range. Microphone inputs shall be 47K ohms unbalanced, convertible to balanced 150 ohms. Auxiliary inputs shall be 500K ohms unbalanced with 0.25 volt sensitivity. A rear mounted treble control shall be provided. Pre-amplifier provides a minimum of five program inputs (two microphones, one tuner-player, two auxiliary) each selected by fluorescent color display push-button.

6. Speaker Selector Panel

- a. This panel shall contain twenty-five (25) two pole, four position switches that are color coded to match functions of Control Panels as follows:

Black (OFF), White (IC), Yellow (Channel A) and Green (Channel B).

This panel design shall allow the addition of annunciator facilities consisting of an annunciator lamp and receptacle for each selected switch mounted behind a full length designation strip.

The annunciator lamps shall be replaceable from the front panel without removing the panel. A receptacle associated with each switch shall permit adding plug-in relays as required for time signal distribution to individual areas as selected on the optional twelve (12) circuit cross connect board. It shall be possible to program the cross connect board from the front of the panel.

There shall be provisions to allow selection of individual speakers to the common bus to enable this bus to be used for 1C application.

Panel shall be 3-1/2-inches high, 19-inches wide and 9-1/4-inches deep.



## 16000 - Electrical

Panel shall be DuKane, model 9A1436A, Rauland model #SWL425 or approved equal. The number of switches shall be as noted in the amendments.

- b. Furnish a Scanner Panel which shall provide control signals to the Selector Switch Speaker Panel to connect the correct station to the Multiplexer Panel, when a call signal is received from the Multiplexer Panel. Each switchbank panel shall be provided with a scanner panel.

### 7. Control Panel for Local Sound System

A local sound system is to be provided in the gymnasium, cafeteria and auditorium or assembly area where shown on plans or required by specs. A switch panel shall be provided with switches from the enclosure for the purpose of connecting the loudspeaker circuits in these areas to either Channel A or Channel B.

Switches shall be constructed so that provisions for actuating priority relays which shall disconnect the loudspeakers from the local amplifier and connect up to the Central Control Rack. Each local sound system switch shall be provided with an LED and shall be illuminated upon operation of system. Panels for local sound system shall be suitably engraved for the various functions and location of equipment. Whereupon the areas noted above have additional functions such as convertible rooms additional LEDs shall provide for each room on their respective panels.

### 8- Power Amplifier - Total of Two (Channel A & Channel B)

Power amplifier shall employ silicon transistors exclusively and be capable of delivering an output (watts) as noted in the Amendments. Output shall be at less than 3 percent distortion 40 to 10,000 Hz.

Frequency response shall be 20 to 20,000 Hz 1 2 dB. Noise level shall be at least 75 dB below rated output. Input shall be 1,000,000 ohms single ended. Rated output shall be obtained with 0.4 volt input. Balanced or single ended 25 volt and 70 volt outputs shall be available at a screw terminal strip. Output regulation shall be within 2 dB from no load to full load. The amplifier shall supply auxiliary voltage of 28 volts DC, 50 milliamps maximum. An input level control shall be provided. The unit shall have operate on 105-130 volts, 50-60 Hz and consume approximately 240 watts. The amplifier shall have protective circuits including a thermal operated relay and an automatically resetting electronic circuit to reduce dissipation under overload or short circuit conditions.

Amplifier shall be 8-3/4-inches high, 19-inches wide and 7-inches deep.

Finish shall be light gray baked enamel. Amplifier shall be DuKane 1A803, Rauland #TAX250 or approved equal.

The minimum power required for each channel at the Central Control Rack to operate all of the speakers in the building (including speakers in the Auditorium, Gymnasium, and Cafeteria) at the same time on the same channel is given in the Amendments.

### 9. Microphone, Tape and Phono Receptacle Input Panel.

Furnish and install on the front panel of the control rack two twist lock receptacles. Hubbell 7582 or the equal by Bryant or Arrow-Hart for connecting a microphone or a turntable. Each



receptacle shall be connected to a point on each input button or selector switch herein before specified. Receptacle shall have white core bakelite name plates inscribed "Mic Phono".

### Tape Recorder Receptacles

A tape recorder "playback" receptacle, the equal of Switchcraft #51 shall be panel mounted and connected to a position on each input selector switch. A network shall be provided to match the level and impedance of a zero level unbalanced output of a standard commercial tape recorder to the system.

A tape recorder "record" receptacle, the equal of Switchcraft #51 shall be panel mounted and connected to a three-position switch marked "CHAN-A-RADIO-CHAN-B". The switch shall be associated with resistors and/or a transformer to provide a zero level signal available at receptacle for recording from system. The switch shall provide a bridged signal from the output of the pre-amplifiers in the Channel A and Channel B positions, and when in the Radio position, shall provide a bridge signal directly from the radio tuner output.

Receptacles shall be suitably inscribed.

Provide (1) ten (10) foot interconnecting cable, with molded mating plugs for the above receptacles.

### 10. Terminal Strips

- a. A bottom rear of the Sound Control Cabinet provide approved terminal blocks with adequate metal or equivalent backing for terminating all incoming loudspeaker, microphone and turntable circuits to the rack.

Terminal blocks for loudspeaker circuits shall be the approved equal of Jones No. 140-21.

Terminal blocks for microphone or turntable circuits shall be the approved equal of Western Electric No. WE L3A. Each block shall be equipped with 80 terminals. Terminals for microphone or turntable circuits shall be of the solder type only.

Furnish and install a directory on the inside of the door of the Rack Directory shall be identical with that supplied for lighting panelboards, and shall identify all circuits terminating at the terminal strips.

- b. Grounding of the mesh shielding of all microphone and turntable conductors shall be accomplished by soldering the mesh shield of each pair of conductors to a separate point on the terminal block. All points on the terminal block to which mesh shields are connected shall be in the same vertical line, and shall be interconnected by a common conductor soldered at each point. This common ground conductor shall be connected to the ground terminal of the rack.
- c. Grounding of insulated conductor of loudspeaker cable shall accomplished in the following manner:

The screw terminals between each adjacent-pair of terminals (1"L8" cable each pair) shall be used to connect the uninsulated ground wire of adjacent cables.

The ground terminals shall be tied together by a No. 18 tinned copper wire which in turn shall be grounded to frame of rack.



## 16000 - Electrical

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- d. The terminal block to which the microphone and turntable circuits are connected shall be isolated from the terminal blocks to which loudspeaker lines are connected by means of a metal barrier.
  - e. FM and AM antenna transmission lines shall be connected to the same terminal block as the microphone and turntable lines.
  - f. In addition to the above terminal strips provide an additional terminal strip, the approved equal of Jones No. 142-4, for terminating the external 120 volt power circuits,, and the 120 volt external pilot light. This terminal strip shall be separate and apart from all other terminal strips.
11. Blank Panels
- Blank panels shall be provided for spaces on the rack not needed for equipment.
12. Finish
- The finish of all panels shall be gray, as herein before specified with controls and switches to match or harmonize.
13. Signal Button
- Mount in a convenient position on the rack a locking type push-button switch the equal of A-H 86710-C. Adjacent to the switch mount a 6-volt lamp set in a miniature base socket (Drake or equal) and covered by a green jewel. This switch shall connect this lamp and the lamp in the Security Office with a 6-volt supply from a transformer connection to the AC power supply immediately after lock switch on AC power control panel. Inscribe push-button "PRIN. SIG."
14. AC Power Wiring to Central Control Rack
- The power supply for the Central Control Rack shall consist of not less than two No. 10 wires in 3/4-inch conduit unless otherwise indicated on Drawings or directed. The power supply shall be furnished and installed by the Contractor for Electric Work. The manufacturer of the Central Control Rack shall provide wiring from the main switch on the AC Power Control Panel to the terminal strip for 120 volt power connection.
15. Pull Box Central Control Rack
- The pull box adjacent to the Central Control Rack shall be of rigid construction, using steel sheets having a thickness not less than No. 14 gauge. Box shall be rigidly braced and firmly fastened to the ceiling of the floor below or adjacent to rack, as indicated on Drawings, so as not to vibrate. The cover shall be attached by Monel metal machine screws.
- Whenever this pull box is mounted over boilers or other heat producing equipment, the four vertical sides shall be lined with a heat insulating material the equal of Celotex or Fiberglass. Insulation shall be at least 1-inch thick.
16. Keys
- All keys for Central Control and Program Racks shall be delivered to the Contracting Officer and to no other person.
17. Main Power Light Connection



The 120-volt pilot light hereinafter described shall be connected through an approved 120-volt terminal strip at lower rear of the cabinet to the main power control switch for the Central Control Rack. Wiring within the cabinet shall be performed by the manufacturer of the Sound System.

18. Program Signal Modification

- a. General - In addition to the functions previously described, the room sound system shall be designed to reproduce a sound signal automatically at loudspeakers for program signaling (time signal distribution).

Program signaling shall be controlled by a program instrument described in Section 16-10.

"ELECTRIC CLOCK EQUIPMENT"

The program signal shall be reproduced at all desired loudspeakers regardless of the setting of the individual speaker switch, the AC power switches of the main gain controls. A building equipped to operate on several programs (Paragraph Speaker Control Panel), the desired loudspeakers for any program shall be pre-selected by setting of the cross connect board.

- b. Program Signal Equipment Required in Building

1. The program instrument described in Section 17-10 "Electric Clock Equipment" shall be installed by the Contractor for Electric Work at location indicated on the Drawings. This Contractor shall furnish and install all necessary conduits and conductors to properly connect the time signal distribution equipment in the Central Control Rack to the Program Instrument. All work shall be performed according to directions from, and to the satisfaction of, the Contracting Officer.

2. Relays

Furnish and install relays which will accomplish the following program control. Relays shall be mounted in the Central Control Rack so as to be easily accessible when the rear door of the rack is open. Each relay shall have a name strip mounted adjacent to it identify the circuit or device to which it is connected.

- a. When the Program Instrument closes contacts or when the Program Signaling Pushbutton is depressed manually, all loudspeakers shall be disconnected from the output side of both power amplifiers (Channel A and Channel B), and shall be connected to the output of the alternator, regardless of the position of the room selector switches. Simultaneously, 120 volt AC power shall be connected to the input side of the alternator.
- b. All relays except the relay which connects 120 volt AC Power to the Alternator shall be actuated by low rating (less than 50 volts) AC or DC power.
- c. Relays which are actuated by the Program Instrument, or by the All Ring Pushbutton shall be of the multi-contact type, positive acting, free from chatter, the equal of Ohmite type "GPRX" Relays.
- d. The relay which connects 120 volts power to the input of the Alternator shall be the approved equal of Arrow-Hart 28300.





## 16000 - Electrical

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- e. Relays shall operate with a low noise level which is not objectionable to the Contracting Officer.

### Current Supply for Relays

Relays may operate either on DC or AC. Actuating or relays shall not interfere with operation of the Sound System.

Wherever DC relays are employed, a selenium oxide rectifier supplying suitable voltages (not over 50 volts) and current shall be provided and properly wired to supply DC power for field coils of the relays specified above.

Wherever AC relays are utilized, furnish, install and connect an approved transformer to produce suitable voltage (not over 50 volts) for relay operation.

- 3. Cross - Connect Panels.

Furnish and install suitable Cross-Connect Panels as part of the Speaker Selector Panel. These cross-connect panels shall permit selection of speakers on each programming circuit.

- 4. Transistorized Signal Generator.

Furnish and install a transistorized signal generator to produce an audible program signal where directed by the program circuitry. This generator shall be as specified below. In lieu of a separate generator, this contractor may use one of the tone signals generated by the Central Switching Exchange.

- a. The input voltage shall be 115 to 135 VAC at 60 Hz.
- b. The power output shall not be less than 125% of Amplifier Rating and in any case shall not be less than 125-watts. The generator shall be capable of supplying this power for at least three minutes without undue heating.
- c. A range of different output impedance shall be available including a 70-volt tap.
- d. The output power regulation, when using any of the input or output taps shall be plus or minus 5% from a 20% to 100% load.
- e. The output frequency shall be 400 Hz and shall have a square wave characteristic.
- f. The output frequency regulation, when using any of the input or output taps shall be plus or minus 5% from a 20% to 100% load.
- g. The generator shall have no moving parts.
- h. The generator shall require no warm-up time and its output shall be available for instant usage after AC power to the unit is turned on.
- i. The generator shall be adequately fused and shall not consume any standby power.
- j. Construction of the generator chassis shall be rugged and adequate heat dissipating devices shall be utilized and shall be satisfactory to the Contracting Officer.





- k. All connections shall be made by approved connections on the chassis.
- l. Furnish and attach a suitable manufacturers' nameplate.
- m. A neon light mounted on the front of the Cabinet shall indicate when generator is functioning.

#### 2.3.4 Power Supply for Priority Relays - (Local Amplifiers)

Where the Drawing require the installation of local sound systems in the Auditorium, Assembly Area, Cafeteria or Gymnasium, a suitable AC or DC power supply shall be provided to actuate relays (in the local amplifier cabinets) which disconnect loudspeakers to the Central Control Rack.. The operating voltage shall not exceed 50 volts, open circuit voltage.

#### 2.3.5 AC Power Control

##### 2.3.5.1 Building Equipped with Audio Visual Center

On a panel approximately 3-1/2-inches high, mounted approximately 4' 6" above the floor in the Central Control Rack, the following switches shall be installed:

1. Three-way lock switch and a 150 volt pilot as selected for connecting and disconnecting the main AC power supply of the entire rack. This switch shall be marked "Main Power Supply", and shall be operated by means of a key different from any other key used in the building. Furnish and deliver four keys to the Contracting Officer.

The lock switch shall be operated by a Corbin type of Yale type key. Switch shall be approved equal of Arrow-Hart 1543-L Key shall be stamped "Sound Systems".

2. A toggle switch and a 150 volt pilot light for connecting and disconnecting AC power supply of Channel B amplifiers. This switch shall be marked "Power Supply--Channel B"

The above switches in (2) and (3) shall be identical with switches used in Class Rooms (see Par. 16-7.41 of this Specification).

##### 2.3.5.2 Building Equipped with Sound Control Closet

In a building equipped with a Sound Control Closet, the lock switch and pilot light described over for controlling the main power supply to the Central Control Rack shall be located on the strike side of door of Sound Control Closet. Switch shall be equipped with a face plate matching other face plates in same enclosure and inscribed "SOUND SYSTEM".

#### 2.3.6 Cabinet Protection

The Sound System manufacturer, at the time of delivery to the jobsite of the Central Control Rack or an Auditorium Cabinet or Console, shall provide this Contractor with canvas covers to protect this equipment during installation and connection of wiring. The canvas shall be of such weight as to withstand normal handling and to protect the metallic surfaces against abrasions and droplet of paint from soaking through. The covers shall be designed to restrict the entry of masonry dust and other alien particles to a minimum. The covers shall extend to within 1" of the floor, and shall be constructed to permit the lower 24" to be rolled up or otherwise raise allowing access to the terminal stress.

The covers shall be kept in place, except for necessary testing of the cabinet until all plastering, Patching and painting in the vicinity is completed, and in no event removed permanently until



## 16000 - Electrical

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permission to this contractor has been granted by the Contracting Officer's representative. The covers shall remain the property of the Sound System manufacturer.

### 2.3.7 Auditorium System

Where shown on the drawings or called for in the specifications, this contractor shall furnish and install on Auditorium Sound System consisting of the following:

#### 2.3.7.1 Amplifier Cabinet

A cabinet shall be mounted in a 14 gauge galvanized sheet steel cabinet set flush in wall, at a location noted on the drawings, in the auditorium. Cabinet shall be 4 inches deep, 20-inches ( $\pm$ ) high and 16 inches in width.

Cabinet shall have a front trim and door, which shall be hinged type, and located at the bottom of the cabinet. Door shall hang vertically.

Amplifier cabinet door shall be equipped with a flush mounted lock with key change.

Trim shall be furnished with grilles for ventilation at top and bottom.

Cabinet shall be as specified.

Where amplifier is indicated as a surface type on wall, this cabinet and trim shall be modified for surface mounting.

Interconnect all apparatus within the cabinet.

Deliver four (4) keys to the Contracting Officer.

#### 2.3.7.2 Amplifier and Controls

This amplifier shall be/solid state, employing silicon transistor s and exclusively.

Amplifiers using tubes or germanium transistors, or amplifiers which are of the semi-flush and protrude more than 1/4-inch from the wall will not be accepted.

The amplifier shall deliver an audio output of 60 watts RMS at less than 3% distortion and have a peak output of 120 watts. Frequency response shall be flat from 20 to 20,000 cycles within  $\pm 1$  dB , and output regulation shall be less than 2 dB from no load to full load.

The amplifier shall provide complete input and mixing facilities for four (4) low impedance microphone inputs either balanced or unbalanced, and two (2) auxiliary inputs.

The microphone inputs shall have an overall gain of at least 113 dB below rated output with all controls at rated gain. The noise level with all controls off shall be at least 80 dB below rated output.

The amplifier shall be designed to operate continuously on line voltages of 105 to 130 volts, 60 Hz AC, with a standby power consumption of no more than 30 watts.

Power consumption at full output shall not exceed 150 watts.

The amplifier shall include at least two separate automatic protective circuits. One shall be a thermostatically controlled self-restoring circuit to prevent damage from prolonged overloads, exceedingly high line voltage, or other conditions that threaten damage. The other shall protect against extreme overloads, such as a shorted output line. This circuit shall automatically monitor the



overload condition at one second intervals and automatically restore operation when the overload disappears.

Amplifiers which do not include protective circuits for the above conditions, or which rely upon fuses alone for protection, or in which the protective circuits are not self resolving, will not be accepted.

The amplifier shall be equipped with an appropriate number of output switches identified as to the location of speaker groups as shown on the drawings. Switch shall be the equal of Arrow-Hart #20905-FR.

In addition provide a switch and a double throw relay for each convertible room and auditorium that will enable each to receive sound from either the Central Control Rack or the auditorium Sound System.

Provide a pilot light for each to indicate when they are connected to Central Control Rack.

Furnish an independent power supply, maximum 50 volts, to energize relays and pilot light circuits for convertible rooms and auditorium.

Acceptable amplifiers shall be DuKane 1A625, Rauland Z060X or approved equal.

### 2.3.7.2 Wiring Within Cabinet

The conductors which terminate at the amplifier input receptacles shall be equipped at one end with a suitable plug (Amphenol, Cannon, or an approved equal) to fit the receptacles on the amplifier chassis; and with U-type lugs the approved equal of Burndy YAV-14 HF type or Aviation Marine Products No. 33799 type or T&B "Staconn" at the other end for connection to terminal block. All other conductors shall be equipped at both ends with the U-type terminal lugs described above.

All U-type terminal lugs shall be equipped with upturned ends to prevent lugs from slipping out from under screws.

All wire within cabinet shall be neatly cabled and attached to cabinet walls in a manner satisfactory to the Contracting Officer.

Provision shall be made in wiring of amplifier for connection to a cabinet 6 volt pilot light on the Central Control Rack.

### 2.3.7.4 Terminals

A 120 volt AC supply circuit from an adjacent panel-board shall be installed by this Contractor as indicated on the Drawings within the cabinet.

All conductors from loudspeakers and microphone receptacles shall terminate in U-type terminal lugs, Burndy YAV-14 HF type or Aviation Marine Products No. 33799 type or T. & B. "Staconn" (with upturned ends). Microphone conductors shall be connected to an approved terminal block mounted within the cabinet. The terminal block mounted within the cabinet. The terminal block mounted within the cabinet. The terminal block shall be so constructed that terminal screws for adjacent conductors are separated by suitable insulated barriers. An identical terminal block shall be mounted within cabinet for loudspeaker conductors.

### 2.3.7.5 Control of Auditorium and Convertible Room Speakers from Central Control Rack



## 16000 - Electrical

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The auditorium loudspeakers shall be connected to a double-throw relay mounted within the cafeteria amplifier cabinet. Each convertible class-room loudspeaker circuit shall be connected to a double-throw relay mounted within the aforementioned Amplifier Cabinet.

These relays shall be controlled by the switches mounted on the Auditorium Control Panel (Central Control Rack). The operation of these switches with signal lights shall be described as follows:

- a. When the switch is in the "OFF" position, the Auditorium loudspeakers and/or convertible rooms shall be connected to the output of the auditorium amplifier.
- b. When switch is thrown to "Channel A" or "Channel B" positions, the auditorium loudspeakers and/or convertible rooms shall be connected to the output of the Central Control Rack.
- c. There hereinafter specified signal lights for the auditorium amplifier shall be connected to the relay control circuits to indicate when the loudspeakers are connected to the output of the Central Control Rack.

### Signal Light for Auditorium Amplifier

In a convenient location on the amplifier (not on the front trim of the cabinet) mount a neon signal light, consisting of a miniature base socket covered by a white jewel. Light shall indicate when the auditorium and/or convertible loudspeakers are connected to the Central Control Rack. Signal light shall have an inscription plate reading "Main Rack Control Indicator."

## 2.3.8 Assembly Area Sound System

### 2.3.8.1 Amplifier Cabinet

Cabinet shall be mounted in a 14 gauge galvanized sheet steel cabinet set flush in wall, at a location noted on the drawings, in the Assembly Area.

Cabinet shall be 4-inches deep, 20-inches ( $\pm$ ) high and 16-inches in width.

Cabinet shall have a front trim and door, which shall be hinged type, and located at the bottom of the cabinet. Door shall hang vertically.

Amplifier cabinet door shall be equipped with a flush mounted lock with key change.

Where amplifier is indicated on drawings or specified as a surface type of amplifier, this cabinet and trim shall be modified for surface mounting.

Trim shall be furnished with grilles for ventilation at top and bottom

Cabinet shall be as specified

Interconnect all apparatus within the cabinet.

Deliver four (4) keys to the Contracting Officer.

### 2.3.8.2 Amplifier and Controls

This amplifier shall be solid stated, employing silicon transistors exclusively.

Amplifiers using tubes or germanium transistors, or amplifiers which are of the semi-flush type and protrude more than 1/4-inch from the wall will not be accepted.



The amplifier shall deliver an audio output of 60 watts RMS at less than 3% distortion and have a peak output of 120 watts. Frequency response shall be flat from 20 to 20,000 cycles within  $\pm 1$ db, and output regulation shall not be less 2 dB from no load to full load.

The amplifier shall provide complete input and mixing facilities for four(4) low impedance microphone inputs either balanced or unbalanced and two (2) auxiliary inputs.

The microphone inputs shall have an overall gain of at least 113 dB below rated output with all controls at rated gain. The noise level with all controls off shall be at least 80 dB below rated output.

The amplifier shall be designed to operate continuously on line voltages of 105 to 130 volts, 60 Hz AC, with a standby power consumption of no more than 30 watts. Power consumption at full output shall not exceed 150 watts.

The amplifier shall include at least two separate automatic protective circuits. One shall be a thermostatically controlled self-resorting circuit to prevent damage from prolonged overloads, exceedingly high line voltage, or other conditions that threaten damage. The other shall protect against extreme overloads, such as a shorted output line, this circuit shall automatically monitor the overload condition at one second intervals and automatically restore operation when the overload disappears.

Amplifiers which do not include protective circuits for the above conditions, or which rely upon fuses alone for protection or in which the protective circuits are not self-restoring, will not be accepted.

The amplifier shall be equipped with an appropriate number of output switches identified as to the location of speaker groups as shown on the drawings. Switch shall be the equal of Arrow-Hart #20905-FR.

In addition, provide a switch and a double throw relay for the Assembly Area enabling to receive sound from either the Central Control Rack or the Assembly Area Sound System.

Provide a pilot light for each to indicate when they are connected to Central Control Rack.

Furnish an independent power supply, maximum 50 volts, to energize relays and pilot light circuits for convertible rooms and Assembly Area.

Acceptable amplifiers shall be DuKane 1A625, Raulaund 2060X or approved equal.

### 2.3.8.3 Wiring Within Cabinet

The conductors which terminate at the amplifier input receptacles shall be equipped at one end with a suitable plug (Amphenol, Cannon, or an approved equal) to fit the receptacles on the amplifier chassis; and with U-type lugs the approved equal of Burndy YAV-14 type or Aviation Marine Products No. 33799 type or T. & B. "Staconn" at the other end for connection to terminal block. All other conductors shall be equipped at both ends with the U-type terminal lugs described above.

All U-type terminal lugs shall be equipped with up-turned ends to prevent lugs from slipping out from under screws.

All wire within cabinet shall be neatly cabled and attached to cabinet walls in a manner satisfactory to the Contracting Officer.

Provision shall be made in wiring of amplifier for connection to a 6 volt pilot light on the Central Control Rack.



## 16000 - Electrical

### 2.3.8.4 Terminals

A 120 volt AC supply circuit from an adjacent panelboard shall be installed by this Contractor as indicated on the Drawings within the cabinet.

All conductors from loudspeakers and microphone receptacles shall terminate in U-type terminal lugs, Burndy YAV-14 HF type or Aviation Marine Products No. 33799 type or T. & B. "Stacon" (with up-turned ends). Microphone conductors shall be connected to an approved terminal block mounted within the cabinet. The terminal block shall be so constructed that terminal screws for adjacent conductors are separated by suitable insulated barriers. An identical terminal block shall be mounted within cabinet for loudspeaker conductors.

### 2.3.8.5 Control of Assembly Area and Convertible Speakers from Central Control Rack

The Assembly Area loudspeakers shall be connected to a double-throw relay mounted within the Assembly Area Amplifier cabinet. Each convertible loud speaker circuit shall be connected to a double-throw relay mounted within the aforementioned Amplifier Cabinet. These relays shall be controlled by the switches mounted on the Assembly Area Control Panel (Central Control Rack). The operation of these switches with signal lights shall be described as follows:

- A. When the switch is in the "OFF" position, the Assembly Area loudspeakers and/or convertible rooms shall be connected to the output of the Assembly Area amplifier.
- B. When the switch is thrown to "Channel A" or "Channel B" positions, the Assembly Area loudspeakers and/or convertible rooms shall be connected to the output of the Central Control Rack.
- C. The hereinafter specified signal lights for the Assembly Area amplifier shall be connected to the relay control circuits to indicate when the loudspeakers are connected to the output of the Central Control Rack.

#### Signal Light for Assembly Area Amplifier

In a convenient location on the amplifier (not on the front trim of the cabinet) mount a neon signal light, consisting of a miniature base socket covered by a white jewel. Light shall have an inscription plate reading "Main Rack Control Indicator".

### 2.3.9 Cafeteria Sound System

#### 2.3.9.1 Amplifier Cabinet

Cabinet shall be mounted in a 14 gauge galvanized sheet steel cabinet set flush in wall, at a location noted on the drawings in the cafeteria. Cabinet shall be 4-inches deep, 20 inches (+) high and 16-inches in width.

Cabinet shall have a front trim and door, which shall be hinged type, and located at the bottom of the cabinet. Door shall hang vertically. Amplifier cabinet door shall be equipped with a flush mounted lock with key change.

Trim shall be furnished with grilles for ventilation at top and bottom.

Where amplifier is indicated on drawings or specified as a specified type of amplifier, this cabinet and trim shall be modified for surface mounting.



Cabinet shall be specified.

Interconnect all apparatus within the cabinet and trim shall be modified for surface mounting.

Cabinet shall be as specified.

Interconnect all apparatus within the cabinet. Deliver four(4) keys to the Contracting Officer.

#### 2.3.9.2 Amplifier and Controls

This amplifier shall be solid-state, employing silicon transistors exclusively.

Amplifier using tubes or germanium transistors, or amplifiers which are of the semi-flush type and protrude more than 1/4-inch from the wall will not be accepted.

The amplifier shall deliver an audio output of 60 watts RMS at less than 3% distortion and have a peak output of 120 watts. Frequency response shall be flat from 20 to 20,000 cycles within  $\pm$  dB, and output regulation shall be less than 2db from no load to full load.

The amplifier shall provide complete input and mixing facilities for four (4) low impedance microphone inputs either balanced or unbalanced, and two (2) auxiliary inputs.

The microphone inputs shall have an overall gain of at least 113 dB below rated output with all controls at rated gain. The noise level with all control off shall be at least 80 dB below rated output.

The amplifier shall be designed to operate continuously on line voltages of 105 to 130 volts, 60 Hz AC, with a standby power consumption of no more than 30 watts. Power consumption at full output shall not exceed 150 watts.

The amplifier shall include at least two separate automatic protective circuits. One shall be a thermostatically controlled self-restoring circuit to prevent damage from prolonged overloads, exceedingly high line voltage, or other conditions that threaten damage. The other shall protect against extreme outloads, such as a shorted output line. This circuit shall automatically monitor the overload condition at one second intervals and automatically restore operation when the overload disappears.

Amplifiers which do not include protective circuits for the above conditions, or which rely upon fuses alone for protection, or in which the protective circuits are not self restoring, will not be accepted.

The amplifier shall be equipped with an appropriate number of output switches identified as to the location of speaker groups as shown on the drawings. Switch shall be the equal of Arrow-Hart #20905-FR.

In addition provide a switch and double-throw relay for each convertible room and cafeteria that will enable each to receive sound from either the Central Control Rack of the Cafeteria Sound System.

Provide a pilot light for each to indicate when they are connected to Central Control Rack.

Acceptable amplifiers shall be DuKane 1A625, Rauland 2060X or approved equal.

#### 2.3.9.3 Wiring within Cabinet

The conductors which terminate at the amplifier input receptacles shall be equipped at one end with a suitable plug (Amphenol, Cannon, or an approved equal) to fit the receptacles on the amplifier chassis; and with U-type lugs the approved equal of Burndy YAV-14 HF type or Aviation Marine





## 16000 - Electrical

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Products No. 33799 type or T. & B. "Stacon" at the other end for connection to terminal block. All other conductors shall be equipped at both ends with the U-type terminal lugs described above.

All U-type terminal lugs shall be equipped with up-turned ends to prevent lugs from slipping out from under screws.

All wire within cabinet shall be neatly cabled and attached to cabinet walls in a manner satisfactory to the Contracting Officer.

Provision shall be made in wiring of amplifier for connection to a 6 volt pilot light on the Central Control Rack.

### 2.3.9.4 Terminals

A 120 volt AC supply circuit from an adjacent panelboard shall be installed by this Contractor as indicated on the drawings.

All conductors from loudspeakers and microphone receptacles shall terminate in U-type terminal lugs, Burndy YAV-14 HF type or Aviation Marine Products No. 33799 type or T. & B. "Stacon" (with up-turned ends). Microphone conductors shall be connected to an approved terminal block mounted within the cabinet. The terminal block shall be so constructed that terminal screws for adjacent conductors are separated by suitable insulated barriers. An identical terminal block shall be mounted within cabinet for loudspeaker conductors.

### 2.3.9.5 Control of Cafeteria and Convertible Speakers From Central Control Rack

The cafeteria loudspeakers shall be connected to double-throw relay mounted within the cafeteria amplifier cabinet. Each convertible loudspeaker circuit shall be connected to double-throw relay mounted within the aforementioned Amplifier Cabinet. These relays shall be controlled by the switches mounted on the Cafeteria Control Panel (Central Control Rack). The operation of these switches with signal lights shall be described as follows:

- A. When the switch is in the "OFF" position, the cafeteria loudspeakers and/or convertible rooms shall be connected to the output of the Assembly Area amplifier.
- B. When the switch is thrown to "Channel A" or "Channel B" positions, the cafeteria loudspeakers and/or convertible rooms shall be connected to the output of the Central Control Rack.
- C. The hereinafter specified signal lights for the cafeteria amplifier shall be connected to the relay control circuits to indicate when the loudspeakers are connected to the output of the Central Control Rack.

#### Signal Light for Cafeteria Amplifier

In a convenient location on the amplifier (not of the front trim of cabinet) mount a neon signal light, consisting of a miniature base socket covered by a white jewel. Light shall indicate when the cafeteria and/or convertible loudspeakers are connected to the Central Control Rack. Signal light shall have an inscription plate reading "Main Rack Control Indicator."

### 2.3.10 Gymnasium Sound System

#### 2.3.10.1 Amplifier Cabinet





Cabinet shall be mounted in a 14-gauge galvanized sheet steel cabinet set flush in wall, at a location noted on the drawings, in the boys gymnasium.

Cabinet shall be 4-inches deep, 20-inches (+) high and 16-inches in width.

Cabinet shall have a front trim and door, which shall be hinged type, and located at the bottom of the cabinet. Door shall hang vertically.

Where amplifier is indicated on drawings or specified as a surface type of amplifier, this cabinet and trim shall be modified for surface mounting.

Amplifier cabinet door shall be equipped with a flush mounted lock with key change.

Trim shall be furnished with grilles for ventilation at top and bottom.

Cabinet shall be as specified.

Interconnect all apparatus within the cabinet.

Deliver four (4) keys to the Contracting Officer.

### 2.3.10.2 Amplifier and Controls

This amplifier shall be solid-state, employing silicon transistors exclusively.

Amplifiers using tubes or germanium transistors, or amplifiers which are of the semi-flush type and protrude more than 1/4-inch from the wall will not be accepted.

The amplifier shall deliver an audio output of 60 watts RMS at less than %3 distortion and have a peak output of 120 watts. Frequency response shall be flat from 20 to 20,000 cycles within  $\pm 1$  dB, and output regulation shall be less than 2 dB from no load to full load.

The amplifier shall provide complete input and mixing facilities for four (4) low impedance microphone inputs either balances or unbalanced, and two (2) auxiliary inputs.

The microphone inputs shall have an overall gain of at least 113 dB below rated output with all controls at rated gain. The noise level with all controls off shall be at least 80 dB below rated output.

The amplifier shall be designed to operate continuously on line voltages of 105 to 130 volts, 60Hz AC, with a standby power consumption of no more than 30 watts. Power consumption at full output shall not exceed 150 watts.

The amplifier shall include at least two separate automatic protective circuits. One shall be a thermostatically controlled self-restoring circuit to prevent damage from prolonged overloads, exceedingly high line voltage, or other conditions that threaten damage. The other shall protect against extreme overloads, such as a shorted output line, this circuit shall automatically monitor the overload condition at one-second intervals and automatically restore operation when the overload disappears.

Amplifiers which do not include protective circuits for the above conditions, or which rely upon fuses alone for protection, or in which the protective circuits are not self-restoring, will not be accepted.

The amplifier shall be equipped with an appropriate number of output switches identified as to the location of speaker groups as shown on the drawings. Switch shall be the equal of Arrow-Hart #20905-FR.



## 16000 - Electrical

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In addition, and only where the Boys Gym and Girl's Gym are adjacent and separated with a folding partition, provide a switch to permit the connection of the Girl's Gym Speakers to the Boy's Gym Amplifier, when the folding partition is open and both Gyms are being used together for one function.

Provide a pilot light for each to indicate when they are connected to Central Control Rack.

Furnish an independent power supply, maximum 50 volts, to energized relays and pilot light circuits for convertible rooms and Boy's Gymnasium.

Acceptable amplifiers shall be DuKane 1A625 or Rauland 2060X or approved equal.

### 2.3.10.3 Wiring Within Cabinet

The conductors which terminate at the amplifier input receptacles shall be equipped at one end with a suitable plug (Amphenol, Cannon, or an approved equal) to fit the receptacles on the amplifier chassis; and with U-type or Aviation Marine Products No. 33799 type or T. & B. "Stacon" at the other end for connection to terminal block. All other conductors shall be equipped at both ends with the U-type terminal lugs described above.

All U-type terminal lugs shall be equipped with up-turned ends to prevent lugs from slipping out from under screws.

All wire within cabinet shall be neatly cabled and attached to cabinet walls in a manner satisfactory to the Contracting Officer.

Provision shall be made in wiring of amplifier for connection to a 6 volt pilot light on the Central Control Rack.

### 2.3.10.4 Terminals

A 120 volt AC supply circuit from an adjacent panelboard shall be installed by this Contractor as indicated on the Drawings within the cabinet.

All conductors from loudspeakers and microphone receptacles shall terminate in U-type terminal lugs, Burndy YAV-14 HF type or Aviation Marine Products No. 33799 type or T.&B. "Stacon" (with up-turned ends). Microphone conductors shall be connected to an approved terminal block mounted within the cabinet. The terminal block shall be so constructed that terminal screws for adjacent conductors are separated by suitable insulated barriers. An identical terminal block shall be mounted within cabinet for loudspeaker conductors.

### 2.3.10.5 Control of Boys' Gymnasium Speakers from Central Control Rack

The Boys Gymnasium loudspeakers shall be connected to a double throw relay mounted within the cabinet. This relay shall be controlled by the switches mounted on the Boys Gymnasium Control Panel (Central Control Rack). The operation of these switches with signal lights shall be described as follows:

- A. When the switch is in the "OFF" position, the Boys Gymnasium shall be connected to the output of the Boy Gymnasium amplifier.
- B. When the switch is thrown to "Channel A" or "Channel B" positions, Boys Gymnasium shall be connected to the output of the Central Control Rack.



- C. The hereinafter specified signal lights for the Boys Gymnasium amplifier shall be connected to the relay control circuits to indicate when the loudspeakers are connected to the output of the Central Control Rack.

Signal Light for Boys Gymnasium Amplifier

In a convenient location on the amplifier (not of the front trim of cabinet) mount a neon signal light, consisting of a miniature base socket covered by a white jewel. Light shall indicate when the Boys Gymnasium loudspeakers are connected to the Central Control Rack. Signal light shall have an inscription plate reading "Main Rack Control Indicator."

2.3.11 Gymnasium Sound System (Girls Gymnasium)

2.3.11.1 Amplifier Cabinet

Cabinet shall be mounted in a 14-gauge galvanized sheet steel cabinet set flush in wall, at a location noted on the drawings, in the Girls Gymnasium.

Cabinet shall be 4-inches deep, 20 inches (+) high and 16-inches in width.

Cabinet shall have a front trim and door, which shall be hinged type, and located at the bottom of the cabinet. Door shall hang vertically.

Amplifier cabinet door shall be equipped with a flush mounted lock with key change.

Where amplifier is indicated on the drawings or specified as a surface type of amplifier, this cabinet and trim shall be modified for this surface mounting.

Trim shall be furnished with grilles for ventilation at top and bottom.

Cabinet shall be as specified.

Interconnect all apparatus with the cabinet.

Deliver four (4) keys to the Contracting Officer.

2.3.11.2 Amplifier and Controls

This amplifier shall be solid-state, employing silicon transistors exclusively.

Amplifiers using tubes or germanium transistors, or amplifiers which are of the semi-flush type and protrude more than 1/4-inch from the wall will not be accepted.

The amplifier shall deliver an audio output of 60 watts RMS at less than 3% distortion and have a peak output of 120 watts. Frequency response shall be flat from 20 to 20,000 cycles within  $\pm 1$  dB, and output regulation shall be less than 2 dB from no load to full load.

The amplifier shall provide complete input and mixing facilities for four (4) low impedance microphone inputs either balances or unbalanced, and two (2) auxiliary inputs.

The microphone inputs shall have an overall gain of at least 113 dB below rated output with all controls at rated gain. The noise level with all controls off shall be at least 80 dB below rated output.

The amplifier shall be designed to operate continuously on line voltages of 105 to 130 volts, 60Hz AC, with a standby power consumption of no more than 30 watts. Power consumption at full output shall not exceed 150 watts.



## 16000 - Electrical

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The amplifier shall include at least two separate automatic protective circuits. One shall be a thermostatically controlled self-restoring circuit to prevent damage from prolonged overloads, exceedingly high line voltage, or other conditions that threaten damage. The other shall protect against extreme overloads, such as a shorted output line, this circuit shall automatically monitor the overload condition at one-second intervals and automatically restore operation when the overload disappears.

Amplifiers which do not include protective circuits for the above conditions, or which rely upon fuses alone for protection, or in which the protective circuits are not self-restoring, will not be accepted.

The amplifier shall be equipped with an appropriate number of output switches identified as to the location of speaker groups as shown on the drawings. Switch shall be the equal of Arrow-Hart #20905-FR.

In addition, provide a switch and a double throw relays for the Girl's Gymnasium to receive sound from either the Central Control Rack, the Girls Gymnasium Sound System or the Boys Gymnasium Sound System (only where both Gyms are separated by a folding door).

Provide a pilot light for each to indicate when they are connected to Central Control Rack.

Furnish an independent power supply, maximum 50 volts, to energized relays and pilot light circuits for convertible rooms and Boy's Gymnasium.

Acceptable amplifiers shall be DuKane 1A625 or Rauland 2060X or approved equal.

### 2.3.11.3 Wiring Within Cabinet

The conductors which terminate at the amplifier input receptacles shall be equipped at one end with a suitable plug (Amphenol, Cannon, or an approved equal) to fit the receptacles on the amplifier chassis; and with U-type or Aviation Marine Products No. 33799 type or T. & B. "Staconn" at the other end for connection to terminal block. All other conductors shall be equipped at both ends with the U-type terminal lugs described above.

All U-type terminal lugs shall be equipped with up-turned ends to prevent lugs from slipping out from under screws.

All wire within cabinet shall be neatly cabled and attached to cabinet walls in a manner satisfactory to the Contracting Officer.

Provision shall be made in wiring of amplifier for connection to a 6 volt pilot light on the Central Control Rack.

### 2.3.11.4 Terminals

A 120 volt AC supply circuit from an adjacent panelboard shall be installed by this Contractor as indicated on the Drawings within the cabinet.

All conductors from loudspeakers and microphone receptacles shall terminate in U-type terminal lugs, Burndy YAV-14 HF type or Aviation Marine Products No. 33799 type or T.&B. "Staconn" (with up-turned ends). Microphone conductors shall be connected to an approved terminal block mounted within the cabinet. The terminal block shall be so constructed that terminal screws for adjacent conductors are separated by suitable insulated barriers. An identical terminal block shall be mounted within cabinet for loudspeaker conductors.



#### 2.3.10.5 Control of Girls Gymnasium Speakers from Central Control Rack

The Girls Gymnasium loudspeakers shall be connected to a double throw relay mounted within the cabinet. This relay shall be controlled by the switches mounted on the Girls Gymnasium Control Panel (Central Control Rack). The operation of these switches with signal lights shall be described as follows:

- A. When the switch is in the "OFF" position, the Girls Gymnasium shall be connected to the output of the Girls Gymnasium amplifier.
- B. When the switch is thrown to "Channel A" or "Channel B" positions, Girls Gymnasium shall be connected to the output of the Central Control Rack.
- C. The hereinafter specified signal lights for the Girls Gymnasium amplifier shall be connected to the relay control circuits to indicate when the loudspeakers are connected to the output of the Central Control Rack.

##### Signal Light for Girls Gymnasium Amplifier

In a convenient location on the amplifier (not of the front trim of cabinet) mount a neon signal light, consisting of a miniature base socket covered by a white jewel. Light shall indicate when the Girls Gymnasium loudspeakers are connected to the Central Control Rack. Signal light shall have an inscription plate reading "Main Rack Control Indicator."

#### 2.3.12 Emergency Sound Alarm System

##### 2.3.12.1 General

Furnish and install all items of equipment indicated on the drawings or hereinafter specified or required, to equip the building with an Emergency Sound Alarm System.

This system shall permit the office personnel to activate an alarm signal device which shall cause a distinctive tone to sound throughout the building corridors, Custodian's office, Fan Rooms and Boiler Room loudspeakers involved shall be transferred immediately to the alarm tone-amplifier output and a predetermined coded tone signal, set at a pre-fixed level shall sound throughout the areas assigned. A reset button shall be provided to de-activate the system.

##### 2.3.12.2 Alarm Initiating Switches

On the office side of the counter in the General Office, where indicated on drawings, provide an A.H. #OBA-1 (Red) push button designed for momentary contact operation.

Provide a wall operated momentary contact push button switch, where shown, the equal of A.H. #OBA (red) to be connected in parallel with counter switch. Switch plate shall be engraved "Emergency, Sound."

Provide a separately flush mounted reset button and neon pilot light where indicated with engraved plate. Operation of reset button shall de-activate the system and return all speakers to normal. Pilot shall indicate when alarm system is energized and ready for operation.

##### 2.3.12.3 Control Cabinet

Furnish and install an amplifier cabinet at location indicated on the drawings. The equipment hereinafter described shall be mounted in the cabinet in a functional arrangement.



## 16000 - Electrical

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The cabinet shall be approximately 22" wide by 15-2/4" high by 13-1/2" deep and shall be constructed of No. 16-gauge cold rolled steel. The cabinet shall accommodate 14" of panel space and panels shall be recessed so that edges are not exposed. Cabinet shall have a pan type front door approximately 1-1/4" deep which shall be fitted with a Yale, Jr. No. 2446 lock.

Finish of cabinet and panels shall be as described in Par. 2.3.3.2..

Cabinet shall be mounted by means of mounting brackets manufactured by the cabinet manufacturer.

Cabinet shall be Premier Metal Products MDK-140 or approved equal.

At the Contractors option, the control equipment for the Emergency Alarm System may be mounted within the Central Control Rack where sufficient space is available and there is no overcrowding.

### 2.3.12.4 Coded Tone Signal Amplifier

The tone signal shall consist of five (5) repeating 750 Hz (frequency accuracy to within 5%) two second tone pulses occurring every two seconds, followed by a 30-second interval. Timing accuracy shall be within 10%. The tone signals shall start immediately upon actuation of the alarm initiation switch, and shall continue until the reset button is depressed.

The coding and tone generator shall be an all solid state electronic unit containing no timing motors or thermal time delay tubes.

### 2.3.12.5 Power Amplifier

Amplifier shall be all solid state (transistorized) with an output capacity of 50 watts frequency response from 200 to 10,00 Hz  $\pm$  3 dB; hum and noise 85db below rated output. Regulation, full load to no load, shall vary not more than 3 dB. A constant voltage line output shall be provided. Amplifier input shall match output impedance of coding signal amplifier.

Provide a latching or holding type relay which shall be activated by the alarm initiation switch, and remain activated until released by the reset switch. The necessary speaker line transfer and amplifier power relays shall be operated by this holding relay. All relay coils shall operate on AC current.

Provide a master AC power disconnected lock switch in cover of cabinet.

### 2.3.12.6 Power Supply

Furnish an AC power supply of ample capacity to operate all control relays and associated equipment. Power supply control voltage shall not exceed 30 volts. Units shall isolate all associated components from AC line.

### 2.3.12.7 Terminal Strips

Control, speaker and AC power circuits shall be wired to Jones terminal strips of the proper size and capacity. Circuits of different levels shall be isolated as described in Paragraph 16-19.03-0 of the Standard.

### 2.3.12.8 Shop Drawings

Incorporate this system with Sound System submission.

### 2.3.13 Loudspeakers

#### 2.3.13.1 General



Furnish and install a loudspeaker of type indicated at each location indicated on Drawings. Unless otherwise specified, the housing of each speaker shall have a finish of color is selected. Grille material and grille cloth (where employed) shall harmonize with the finish of the housing. Samples of finishes shall be submitted to approval.

The mounting of the loudspeakers in the Auditorium and Gymnasium shall be in accordance with directions of the Contracting Officer, with exact setting of loudspeakers determined after experiment at building.

All other loudspeakers shall be securely fastened to the wall.

All speakers located in TALK BACK/LISTEN IN areas shall be modified to perform in the required manner.

### 2.3.13.2 Mounting Height of Loudspeakers

See Drawings for mounting height of loudspeakers above finished floor and other mounting details.

In general, unless otherwise noted, all necessary supporting members required to rigidly fasten speaker units to building structure in an approved manner shall be included as a part of this Contract.

### 2.3.13.3 Guards

A guard shall be provided for each loudspeaker where the Drawings indicate such a guard shall be provided.

The guard shall be rectangular in shape, built-up of cadmium plate 3/8" x 1/8" half hard steel ribs and shall be securely fastened to the wall as directed.

Guards shall be painted by this Contractor with one coat of lead, zinc and titanium paint and a second coat of aluminum or other paint as directed. Second coat shall be applied after guard is erected. Shop drawings showing constructions details and method of mounting on wall shall be submitted for approval prior to manufacture.

### 2.3.13.4 Description of Loudspeakers

#### Type A Loudspeaker

- A. Type A speakers shall be of the permanent field dynamic type with approved surface mounted housing. Speaker shall have a 5 watt nominal rating.

Speaker unit shall be 7 or 8 inches in diameter, of the cone type, employing "Alnico V" metal or ceramic magnet and shall have a frequency response of 30 to 15,000 Hz. Provide a suitable multi-tap speaker matching of voice coil and system line impedances.

- B. Housings

Housings shall be of an approved sloping front type, made of metal or wood as selected, approximately 15" height by 11" width by 7" depth at top and 4" at the bottom. Housings shall be acoustically matched to the speaker units to provide the widest range of reproduced signals without cavity resonance.

- C. Bracket





## 16000 - Electrical

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In new buildings, the manufacturer of the speaker shall supply the housing equipped with a mounting bracket capable of mounting the assembly to any standard, flush outlet box.

In existing building, boxes shall be omitted. Housing shall be mounted on a suitable plate which shall be mounted on the wall.

- D. Acceptable Loudspeakers are RCA CR 5412C Assembly (RCA MI-12478, speaker unit, housing and transformer) or Stromberg Carlson RC-23/TR-B or approved equal by Altec-Lansing, DuKane Corp., David Bogen Company or Rauland-Borg Co.

### Type A1 Loudspeaker

- A. This high-fidelity speaker assembly shall consist of a cone type 8-inch diameter speaker and multi-tap transformer unit with a smooth response from 30 to 15,000 Hz to a power handling capacity of 10 watts. Magnet weight 6.8 ounces of Alnico V or ceramic magnetic material with aluminum voice coil wire.

- B. Housing

Components shall be set in a sloping front surface mounted furniture grade 1-2" plywood enclosure natural finish. Enclosure dimensions to approximate 12-inches high, 15-inches wide, 8-1/2-inches deep on top and 5-1/2-inches at bottom. Provide opening in back for access to flush outlet box with provisions for rigidly fastening speaker to wall or outlet box. Inside of box shall be lined with 1-inch insulating material. Provide a rectangular shadow box-frame with plastic grille for speaker opening.

### Type D Loudspeaker

- A. These speakers shall be 15-inches in diameter and shall be of the co-axial duo-cone type. Frequency response shall be from 50 to 15,000 Hz within 6 dB. Coverage angle shall be at least 90 degrees over the entire spectrum. Power handling capacity shall be at least 10 watts.

- B. Housings

Unless otherwise indicated on drawings or specified speakers shall be flush mounted in not less than 3/4-inch plywood enclosures at location indicated.

Enclosures shall be hinged where necessary for access. Joints shall be glued and screwed air tight. Inside of box shall be lined with 1-inch aerator or other approved insulating material. Inside and outside surfaces of enclosure shall be spray painted with one coat black enamel. Gap between enclosure and grille shall be covered with approved sound isolating material.

Enclosures covering openings will be furnished by others. This Contractor shall install speakers at most favorable angle as recommended by sound system manufacturer and unless otherwise noted or specified shall provide all necessary bracing and/or supports to fasten units in an approved manner.

- C. Acceptable loudspeakers are RCA-LC1A, Stromberg-Carlson RF-475 or Altec-Lansing 605A, Electro-Voice Sentry II.

### Type D-2 Loudspeaker

- A. This speaker shall contain five (5) high fidelity 8" cone type speaker mechanisms. Distribution angles shall be approximately 25 degrees vertically and 80 degrees horizontally. Frequency





response shall be from 50 to 18,000 Hz with uniform response. Power handling capacity shall be 25 watts complex audio wave.

B. Housing

These speakers shall have a semi-circular steel housing of less than 16-gauge, acoustically treated. Approximate dimensions are 44" high x 12" wide x 7" deep. Front of speaker shall have a plastic grille.

Provide brackets for flush mounting in recess (with finished grille by others).

C. Acceptable speakers are the approved equal of RCA loudspeaker assembly No. Cr55000 or Electro-Voice LR-4SA.

Type E Loudspeaker (For Outdoor Use, Playground, Corridor, etc.)

A. Type E Loudspeaker shall have a nominal rating of not less than 10 watts.

Loudspeakers shall be not more than five inches long; maximum diameter of horn shall be 7-inches.

Each loudspeaker mechanism shall be of the permanent magnet type using "Almico V" metal. Each loudspeaker shall be equipped with a marine type non-vibrating metal re-entrant baffle, completely weatherproof and raintight, and designed for outdoor use. Baffle shall have a distribution angle not less than 45 degrees horizontally and vertically. Speaker shall be equipped with a low frequency cut-off for clarity of speech and signal reproduction. The construction of the speaker shall be dark gray or other approved subdued color. If so directed by the Commissioner, this Contractor shall paint loudspeaker and connected conduit, boxes, fittings, etc., to match surroundings.

Speaker shall be equipped with a suitable multi-tap transformer of at least 10 watts rating which will permit correct impedance matchings of voice coil and system line impedances.

B. Mounting of Loudspeaker. The loudspeaker shall be mounted as directed, at location indicated on Drawings, by means of at least three expansion bolts or other approved non-rusting fasteners. Conduits and conductors shall be connected in accordance with directions from the Commissioner. From the weatherproof box, lead covered two-conductor wire shall be run to speaker, and connected as desired.

C. Acceptable loudspeakers are RCA MI-6317-C/12371A miniature marine type, Stromberg Carlson RS-16 or equal by Altec Lansing, DuKane Corp., Racon or Atlas.

Type "E" Loudspeaker for Use in Corridors -- Mounting

Type E loudspeaker as hereinafter modified, shall be used in corridors, where indicated. This unit shall be separately mounted on a 90 degree bracket so that the axis of the loudspeaker is parallel with the wall to which it is attached. In some instances, as explained below, the speaker will be mounted on a 135 degrees angle bracket so that the speaker axis will be set at 45 degrees with respect to the wall. The transformer for this unit shall be installed in a flush wall multi-gang box. The cover for the wall box may be a standard multi gang face plate with a bushed hole for a cable loop between the transformer and the loudspeaker, or one side of the angle mounting bracket may also be used to cover the wall box opening and be secured to the wall box. In the latter method, include a bushed hole through the bracket for the wiring loop.



## 16000 - Electrical

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The angle iron mounting bracket shall be No. 14 gauge, cold rolled steel, and finished to match the loudspeaker. The diameter of the loudspeaker at its base shall be the minimum size for both legs of the mounting angle except where on leg of the angle must be increased to overlap the wall box opening.

At certain locations, where two corridors intersect at right angles, provide a 135 degree angle bracket, where indicated. The centerline of this speaker shall coincide with the centerlines of other equipment, such as a bell, gong, or horn in the general area.

### Type E-1 Loudspeaker

This speaker when called for shall be of the double re-entrant type capable of handling 25-watts of audio program material. The driver unit and built-in transformer shall be suitable protected in a weatherproof spun aluminum housing which may be removed for service. The horn shall have a sturdy aluminum base integrally cast with the tone arm. Bell and reflex reflector shall be exponentially spun of heavy gauge mounting to a flat surface. A wing nut shall lock the horn in any desired vertical position.

Overall assembly shall be approximately 2-1/2" long x 9" diameter. Frequency response shall be 350-8500 Hz. Built-in transformer shall be equipped with suitable impedance taps to be compatible with valves used on other speaker assemblies. Axial sensitivity shall be at least 108 dB with 1 watt input measured at 4-feet at 2500 Hz.

Each speaker shall be furnished with a piece of neoprene sheathed cord, 2 No. 16 conductors for flexible connection to the LS Cable in the weatherproof box outlet shown on the plans.

Neoprene sheathed cord shall be sufficiently long for connection to loudspeaker cable as directed and as specified.

Speaker shall be RCA MI-38452, Electro-Voice PA3ORT, or an approved equal by Stromberg Carlson DuKane Corporation, Racon RO-25T, or Atlas AP-30T.

### Type E-2 Loudspeaker

This speaker shall be of double re-entrant type capable of handling 30-watts of audio program material. Frequency response shall be from 80 - 10,000 Hz. Axial sensitivity shall be at least 117-db with 1-watt input measured at 3 feet. Transformer shall be equipped with suitable impedance taps to be compatible with values used on other speaker assemblies. Speaker shall be furnished with a neoprene sheathed cord, two No. 18 conductors, of sufficient length to permit a flexible connection to the loudspeaker cable in weather proof outlet box as shown on the drawing.

Horn shall be ruggedly constructed of heavy gauge aluminum spinning and/or castings. Bell shall have an exponential expansion rate. Throat of horn shall have an appropriate female threading to receive drive unit. Horn shall be provided with malleable cast iron bracket for mounting and orientation. Bracket shall attach to a standard 1-1/4" pipe fitting. Provide wing nut for locking horn in desired position.

Horn driver unit shall be encased in an approved weatherproof enclosure. Top of this enclosure shall be provided with appropriate male threading for connection of driver unit to horn.



Length of assembled unit shall be approximately 23-inches. Bell diameter of horn shall be approximately 20-1/2".

Horn driver unit shall be the equal of RCA MI-14851. Horn shall be the equal of RCA MI-12482.

#### Type F Loudspeaker

- A. Loudspeakers -- The loudspeaker shall consist of the "Type A" loudspeaker herein before described, without the housing, mounted on a suitable plywood baffle. The speaker and baffle shall be installed in the box hereinafter described, in accordance with the directions of the Contracting Officer.
- B. Box -- A suitable metal box supplied by the Manufacturer of the Sound System shall be furnished by this Contractor and installed as directed, flush in the wall, at location indicated on the Drawings.
- C. Grille -- This Contractor shall furnish an approved steel grille, Harrington-King "Style S" (56% openings) or approved equal, at least 1/8-inch thick, of proper dimensions to cover the box herein before described, and to overlap the finished wall surface by at least 1/2" on all sides of the box. This Contractor shall install the grille in such a manner as to completely cover and protect speaker mechanism. Grille shall have a plastic mesh fastened to the back to render grille pencil proof. Grille will painted by other Contractor.

#### Type FS Loudspeaker

These speakers are similar to type F speakers described above, except units shall be designed for surface mounting.

Furnish a sturdy wood frame around box to meet edge of grille. Frame and grille shall be finished in matching color.

#### Type F-1 Loudspeaker (Flush Wall Type)

- A. The loudspeaker shall consist of the "Type A" loudspeaker herein before described, without the housing, mounted on a plaque shall be installed in the box hereinafter described, in accordance with the director of the Contracting Officer.
- B. Box  
A suitable galvanized steel box supplied by the Manufacturer of the Sound System shall be furnished by this Contractor and installed as directed, flush in the wall, at location indicated on the Drawings.
- C. Plaque  
This Contractor shall furnish approved steel plaque and grille combination of proper dimensions to overlap the finished wall surface by at least 1-2" on all sides of the box. Plaque shall be made of No. 20 gauge steel with beveled edges. Center cut-out for speaker shall be backed by a No. 20 gauge steel grille of "cross-moire" design. Both grille and plaque shall have a baked enamel finish, suitable if necessary, for repainting to match wall by other Contractor.

#### Type F-2 Loudspeaker

These loudspeakers shall consist of a "Type A" unit herein before described except as follows:



## 16000 - Electrical

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Speaker shall be mounted on a 3/8" painted plywood plaque fastened to lips of an enclosing metal box. Box shall be not less than 16 gauge galvanized steel and approximately 10 x 12 x 4 inches.

Assembly shall be mounted approximately 1/4-inch above upper surface of removable section of perforated metal pan ceiling where indicated. Acoustical material shall be omitted at speaker locations. Speaker boxes shall be supported by substantial steel straps to the structure in an approved manner by this Contractor.

An approved marker will be inserted in metal pans by others at speaker locations for identification and maintenance.

### Type J Loudspeaker

Each type J loudspeaker were indicated on Drawings shall be a flush ceiling assembly designed for ceiling mounting. Assembly shall consist of an acoustically treated cylindrical metal housing, mounting frame, cone type "A" speaker mechanism with transformer and air duct type metal grille designed to provide maximum sound diffusion. Depth of assembly of metal housing shall be 8". Weight of unit shall not exceed 10 lbs. Ceiling loudspeaker assembly shall be RCA CR 3443-A, or an approved equal.

### Type K Loudspeaker

At each location when shown on the drawings, provide and install a surface mounted ceiling speaker assembly consisting of a cone speaker similar to Type-A assembly mounted in a spun aluminum housing.

Housing shall be approximately 15-inches in diameter and 5-1/8" deep, constructed of not less than 16 gauge aluminum. Speaker openings shall be protected by a substantial cross-moire grille material. Speaker unit shall be surrounded by sound-absorbing material.

Housing shall be provided with heavy gauge circular back plate for fastening speaker to ceiling outlet box by means of 4-rust proofed machine screws. Assembly shall be finished in a baked enamel of color selected by the Contracting Officer.

Speaker assembly shall be RCA type CR-2944 or equal.

### Type M Loudspeaker

This loudspeaker assembly shall be designed for surface ceiling mounting and shall consist of a type-A loudspeaker unit, a spun aluminum housing and a circular backplate for mounting.

The housing shall have a diameter of 13-1/2" and a depth of 4-1/4" and shall be constructed of not less than 18-gauge aluminum. Speaker openings shall be protected by a cold rolled steel grille not less than 20-gauge.

The housing shall contain integral reinforcing rings and shall be sprayed with undercoating and lined with patched jute to prevent mechanical and acoustical resonances. The housing shall be finished satin brushed aluminum.

The housing shall be provided with a heavy gauge circular back plate for fastening speaker to ceiling outlet box by means of 4-rust proofed machine screws.

Housing shall be Soundolier type-260 or approved equal.



#### Type R Loudspeaker

This loudspeaker assembly shall be designed for flush ceiling mounting and shall consist of a type A loudspeaker, a one piece stamped metal grille, a plywood sub-baffle and a galvanized steel backbox.

The grille shall be made of #18 gauge cold rolled steel and shall have an opening constituting of louvers arranged in 8" square pattern. Louvers of a circular configuration will not be acceptable. Louvers shall have an angle of 45 degrees.

The edge of the grille shall be chamfered to a depth of 3/16". Overall dimensions shall be 12-1/2" x 12-1/2". Color of the grille shall be as selected by the Contracting Officer.

The sub-baffle shall be made of 1/4" thick plywood and shall be finished in dull black so as to be inconspicuous.

The back box shall be made of #16 gauge galvanized steel, and shall be 11-3/8" x 11-3/8" x 6". Box shall be acoustically treated to eliminate metallic resonance.

Square flush type ceiling loudspeaker assembly shall be RCA CR-8050A, or approved equal.

#### Type RS Loudspeaker

This speaker shall be similar to type R speaker describe above, except unit shall designed for mounting. Box shall be 12-1/2" x 12-1/2" x 6" and shall be made of #16 gauge cold rolled steel with a zinc chromate primer. Box shall be finished to match color of grille.

Square surface type ceiling loudspeaker assembly shall be RC CR-8050B, or approved equal.

#### 2.3.14 Privacy/Call-In Switch

Furnish and install at locations in each room or area where indicated on the plans or called for in the specifications a triple action Privacy/Call-In Switch, on a wall at 5'6" above the finished floor. Where new wall construction is involved, this switch shall be mounted in a flush single gang box with suitable engraved face plate. Where the switch is to be mounted on an existing wall, a suitable single gang, surface type. Wiremold box shall be furnished with suitable engraved face plate. Where new wall construction is involved, wiring shall be run to this switch in conduit buried in the wall. Existing wall construction shall require that income wiring be installed in surface metal raceway unless otherwise indicated.

This Privacy/Call-In Switch shall have three positions labeled "Privacy", "Normal", and "Call." The switch shall generally return to the "Normal" mode when not called upon to activate either of the other two modes.

This switch may take the form of separate button for each mode, the form of a three position rocker switch, or any other approved form. This switch shall be heavy-duty and vandal resistant and shall be furnished with a nameplate on which the three modes shall be engraved. The cover plate shall be designed to accept a locking cover if the Contracting Officer shall choose to specify such a cover at some time in the future. All exposed screws shall be spanner head type.

This switch shall accomplish the following functions:

1. Activation of the switch into the "Normal" position or mode shall permit two-way conversation between the staff loudspeaker in the room and the Central Control Rack and shall also permit



## 16000 - Electrical

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the Central Control Rack to listen-in to the room while the switch is in this mode. The Central Control Rack shall also be capable of signaling the room and delivering normal audio program material to the room.

2. Activation of the switch into the "privacy" position or mode shall signal the Central Control Rack and its Administrative Telephones. Flashing of the switch two or more times shall indicate an emergency or priority call to the Central Control Rack.
3. Activation of the switch into the "Privacy" position or mode shall be a maintained type of action. The switch shall remain in this position until released. The activation shall prevent any listening-in by the Central Control Rack or any two-way conversation between the Control Rack and the staff loudspeaker involved. Activation into this mode however shall not prevent the Central Control Rack from signaling the staff loudspeaker or from delivering normal audio program material.

This switch shall be DuKane 9A1745, Rauland 0510 or the approved equal.

### 2.3.15 Telephones

#### 2.3.15.1 General

The electrical contractor shall furnish and install telephones at locations noted on the documents. All outlet boxes, mounting hardware shall be furnished and installed by the electrical contractor. Description of the type of telephones to be utilized are noted in the paragraphs that follow.

#### 2.3.15.2 Administrative Telephones

Furnish and install administrative telephones where indicated on the documents.

All administrative telephones shall be furnished with digital display built-in or attached to the telephone. All telephones shall be push button, touch tone type providing two wire balanced transmission complete with dial tone, ringing, busy signal, and digital readout.

All phones shall be desk type with suitable extension to a nearby wall outlet.

All phones shall be capable of performing all functions outlines in this specification.

All administrative telephones shall be the approved equal of Rauland ACS-33D, DuKane, Model 7A995 or an approved equal.

#### 2.3.15.3 Staff Telephones

##### A. Wall type - Hand set exposed.

Furnish and install a telephone handset designed for wall mounting. It shall include a flush mounting. It shall include a flush mounting plate for the telephone to be mounted in a cradle. The unit shall measure 2-3/4" side, 9-1/8" high and approximately 3" deep. The mounting plate shall be standard single gauge, stainless steel. The telephone unit shall be similar to Bogen HS5R, DuKane 9A680/7A540 or an approved equal.

##### B. Wall type - Handset enclosed in cabinet.

Furnish and install a telephone handset designed for wall mounting. It shall include a flush mounting. It shall include a flush mounting plate for the telephone to be mounted in a cradle. The unit shall measure 2-3/4" side, 9-1/8" high and approximately 3" deep. The mounting plate



shall be standard single gauge, stainless steel. The telephone unit shall be similar to DuKane 9A680/7A540 or an approved equal.

These staff telephones shall be installed in a cabinet to be furnished and installed by this contractor. See Standard Detail Sheet E-2, Series F Drawing 775A for details of cabinet.

### 2.3.15.4 Elevator Telephone

Furnish and install a telephone, similar to staff telephone, located in the elevator cab. The Contractor will provide the box in the elevator and trailer cable to the box. This contractor shall make all necessary connections for the proper functions of the telephone.

The Electrical Contractor is cautioned to properly coordinate this installation with the General Construction Contractor, and to provide a telephone instrument that will fit into the cabinet furnished in the Elevator Cab.

### 2.3.16 Local Volume Controls

#### 2.3.16.1 Volume Controls for Speaker Circuits

##### A. General

Furnish and install a volume control at each location indicated on the drawings.

##### B. Volume Control

Volume Control shall consist of a single T-pad variable resistible network and shall be of the non-shut-off type.

Volume Controls shall have sufficient power capacity to carry currents of the circuits they carry currents of the circuits they control and shall be the approved equal of the Daven power attenuators. The attenuation in the last position of the control shall not exceed between 12 and 16 dB.

Each Volume Control shall be connected, as indicated on drawings to control loudspeakers in the respective enclosure.

##### C. Box and Trim

Box of Volume Control shall be constructed from No. 14 gauge steel and shall be of ample size to contain T-pad network described above. Box shall be flush mounted as indicated on the Drawings.

Trim of box shall be of No. 14 gauge steel finished to match adjacent metal. Trim shall contain a piano hinged door equipped with lock, Yale Jr. No 2446 or an approved equal. Completely close all opening around inside control plate. No wires shall be visible or accessible.

The words "Loudspeaker Volume" shall be inscribed on face of trim.

##### D. Where required on drawings, install in volume control box, additional control switches, Arrow-Hart No. 20905FR, or equal, for local control of loudspeaker. Switches shall have properly inscribed nameplate.

#### 2.3.16.2 Volume/Mixing Controls for Amplifiers





## 16000 - Electrical

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Furnish and install at location indicated on the Drawings, a remote microphone mixing control Stromberg-Carlson RV-1009-6 or approved equal. Control shall be designed to operate with a pre-amplifier mixer in a manner as herein before specified. It shall consist of five variable units which shall individual control the gain of the five inputs, and one master variable unit to control the gain of the five inputs as a unit. The control units shall be mounted in a suitable flush box with a piano hinged cover and an approved lock. Furnish two keys for lock to the Contracting Officer. Cover shall be No. 14 gauge steel finished satin chromium. Face of trim shall be inscribed "Loudspeaker Volume."

Each control shall be inscribed to agree with inscription on corresponding control of pre-amplifier in amplifier cabinet.

### 2.3.16.3 Special Mixing Control (Music Room-Band Practice Room).

Provide and install at each of the locations shown in the Bank Practice and Music Rooms, a box, internal plate and trim meeting previous specifications. Plate shall contain (2) broadcast quality microphone attenuators of the ladder type, with decent knob mechanism in 2 dB steps with a total of about 20 dB, and an insulated type earphone jack. Attenuators shall be as made by Daven. Earphone jack shall as made by Switchcraft. Jack shall be connected to an L.S. cable run separately (to the C.C.R.) from the LS cable feeding the speakers in the room. The attenuators shall have their outputs mixed and fed back to the C.C.R. as one (1) microphone circuit. Each Special Mixing Control is to be furnished with one (1) Brush BA-200 or approved equal crystal element headset equipped with plug to match earphone jack.

### 2.3.16.4 General Office Sound Control

Furnish and install an L-Pad volume control and a selector switch for the Loudspeaker, and a signal light on the face plate of a flush mounted 3-gang box at location indicated on Drawings. The volume control and selector switch shall be so connected two circuits (one from each channel) from the Central Control Rack that the loudspeaker can be connected to either channel and the sound volume adjusted, all independent of the Central Control Rack. The signal light shall be a 6-volt lamp set in a miniature base socket (Drake or equal) and covered by a green jewel. This shall be connected to the push button on the Central Control Rack.

Faceplate finish shall be as selected by the Contracting Officer to match adjacent metal. Inscribe faceplate as indicated on Drawings.

### 2.3.17 Microphones

#### 2.3.17.1 General

The Amendments indicate the number of microphones of each type which are to be furnished by this Contractor. Microphones shall be delivered to the Contracting Officer.

All microphones shall be of the dynamic type. Each microphone shall be equipped with a dustproof screen which shall harmonize with the microphone finish. Each microphone shall be equipped with a swivel attachment for mounting on a stand.

Microphones shall be of the low impedance type, suitable to the impedance of the voltage amplifiers with which they are used.

Microphone and stands shall have a finish acceptable to the Contracting Officer. Submit for approval a sample of each type of microphone and each type of stand.





2.3.17.2 Announce Type Microphone (Offices Only)

This type of microphone shall be exceptionally rugged of the omni-direction dynamic type. The frequency response shall be from to 11,000 Hz. The output level shall be not less than 55 dB with zero dB equaling 1 mw/10 dynes/(cm squared). Impedance shall be 150-250 ohms balanced. Cable length attached to microphone shall not be less than 15 feet with Hubbell No. 7567 plug on end.

Acceptable Announce Type microphones are RCA MI-12039A, Stromberg Carlson MD-37AS, Electro-Voice 630-LO-Z, Turner 251 or equal.

2.3.17.3 General Purpose Type - (Playrooms, Lunchrooms, Gyms, Auditorium, Lecture Halls, etc.)

This type of microphone shall be a cardioid dynamic type with uniform frequency response form 60 to 15,000 Hz. Output level for 150 ohm impedance shall -57 dB with o dB equaling a-mw/10 dynes/(cm squared), EIA sensitivity rating shall be -151 dB for 150 ohm impedance. Provide with a bass-tilt switch offering a choice of 05 or 10 dB attenuation at 100 Hz. Electro-Voice 674-LO-Z. Turner S-500, Shure or equal will be acceptable.

2.3.17.4 Play Yard Type (Outside)

This microphone shall be an omnidirectional, dynamic type with a magnetic shield to prevent dust and magnetic particles from diaphragm. Uniform response from 70 to 10,000 dynes/(cm squared), EIA sensitivity rating shall be -155 db. Provide lavalier neck assembly to hold microphone. Electro-Voice 647A-LO-A, Turner #220A, Shurt #570, or equal will be acceptable.

Cable length attached to this microphone shall be not less than 15 feet. Supply one (1) microphone extension cable minimum 25 feet long of Belden No. 8428 or equal, heavy duty, rubber covered, shielded microphone cable, with Hubbell 7567 three-pole twist lock plug at one end and Hubbell No. 7555 three-wire twist lock cord connector.

Provide 7580 receptacle for Play Yard microphone.

2.3.17.5 Stands

- a. The microphone in security Office shall be attached to a substantially constructed table stand approximately 8" high with built-in microphone switch. Microphone switch shall be of the long leaf anti-capacity type and permit push-to-talk or lock-to-talk operation. Switch contacts shall not be grounded to frame of stand.

Acceptable small stands are RRCA MI-6427, Electro-Voice 418-S (??) or approved equal.

- b. All microphones shall be permanently fastened to substantially constructed stands which are adjustable in height from 36 inches to 66 inches above the floor.

Acceptable large stands are RCA MI-4068-D, Atlast MS-20 or approved equal.

- e. Furnish and install on the Reading Stand, furnished under another contract, a flexible microphone stand. The flexible stand shall consist of a flanged 1-1/4" in diameter fastened through the level surface of the reading stand by means of chrome plated button head machine screws, lockwashers and nuts, on the left hand side, rear. The stem of the stand shall is approximately 5/8-inche in diameter and 19-inches long, constructed of coiled, chrome plated steel to give "gooseneck flexibility. One end of the gooseneck shall be threaded for insertion into flange base and the other end threaded to fit the "General Purpose Type" microphone



## 16000 - Electrical

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normally used on the floor stand provided for all Auditoriums. No microphone shall be supplied with this stand.

### 2.3.17.6 Microphone Cables

Each microphone shall have 25 feet of approved 2 conductor rubber insulated, shielded cable on job as directed to suit conditions. Each microphone cable shall be equipped with a 3-conductor polarized plug the equal of Hubbell 7567, Bryant or A-H.

### 2.3.18 Portable Turntable

Furnish and deliver to the Contracting Officer one (1) portable record player meeting the following specifications:

The record player shall be a portable unit complete with fittings to permit operation with the building sound system. The case shall be ruggedly constructed of 3/8" thick wood and neatly covered with leatherette.

The top cover shall be hinged and made removable. Cover shall include a positioning device to keep turntable in position while being carried. The eight corners shall be provided with brass reinforcing corner pieces. Four brass feet shall be provided to protect the lower surface while the case is in a stored position. Four rubber feet shall protect the lower surface while the case is in the horizontal playing position. The cover shall fasten to the case by means of two brass latching devices. The motor board shall be constructed of 1/2" plywood that is flocked to match the flocking on the turntable. Case shall be provided with suitable hinged, molded plastic carrying handle.

The turntable shall permit playing of standard lateral cut records at speeds of 78, 45, and 33-1/3 rpm. The turntable shall be lathe-turned and balanced, made of laboratory tested aluminum casting. Turntable shaft shall be hardened, ground and polished. The motor shall be of the induction type designed for smooth, quiet, vibration-free operation, fitted with a Lamitex motor pulley. Means shall be provided to make speed changes instantaneously without stopping turntable or removing disc. Noise level shall be 30 dB below average recording level.

The tone arm shall be capable of playing either standard groove or microgroove recordings. Tone arm shall be provided with stand possessing locking feature when not in use. Cartridge shall be of the turn-over types employing ceramic unit. Frequent response shall be essentially flat on Orthocoustic characteristic to within plus or minus 2 dB from 30 to 12,000 Hz. Cartridge shall be provided with a 1-mil diamond stylus. Impedance of unit shall be appropriately reduced to match the impedance of the sound system input, using pads and isolation transformers to provide a balanced signal source. Output level shall be equal to microphone output level under normal usage.

A volume control shall be mounted on the motor board to permit control of the volume reproduction. Control shall be provided with suitable escutcheon.

A three-wire "SJ" type power cable shall be provided with unit, cable being eight feet long and terminated in a cord grip plug, the equal of Hubbell No. 5264. One wire shall ground the frame of the motor.

Portable record player shall be provided with an eight foot signal cable terminated in a Hubbell No. 7567 twist lock plug. Cable shall be of rubber covered two conductor shielded cable equivalent to the microphone cables used in the building. The shield shall be connected to the third pole of the plug.



Acceptable record players are RCA Model CR-4829-3SA, Bogen Model 1004, Lenco L-75, or an approved equal by Stromberg Carlson Company.

2.3.19 Wiring

2.3.19.1 Furnish and install all conduits, conductors, boxes receptacles, herein specified, or required for the proper operation of the sound systems. All conduits and conductors, unless otherwise therein specified or indicated on the Drawings, shall meet the requirements of Sections 16-5, 16-6, and 16-7 of the Standard and Amendments.

2.3.19.2 "Intercom Cable" to Privacy/Call-In Switch shall be a four conductor copper cable and shall consist of two number 20 AWG standard twisted pair shielded, and two number 20 AWG stranded conductor unshielded.

Cable shall have aluminum-polyester shield over two conductors, 20 AWG stranded tinned copper drain wire, polyethylene insulated conductors cabled, chrome vinyl jacket.

Cable shall be Belden, catalog #8722 or approved equal.

Submit sample of conductor for approval.

2.3.19.3 "Loudspeaker Cable" shall be a four conductor, number 20 AWG, copper cable and shall consist of two number 20 AWG stranded twisted pair shielded and two number 20 AWG stranded conductor unshielded. This cable shall be called an "LS Cable" on the drawings.

Cable shall have aluminum-polyester shield, number 20 AWG, stranded, tinned copper drain wire, polyethylene insulated conductors cabled, chrome vinyl jacket. Cable shall be Belden, catalog #8722 or approved equal.

Submit sample of cable for approval.

2.3.19.4 "Administrative Cable" - Administrative telephone cable shall be twenty five (25) pair, number 22 AWG conductor cable. Cable shall have tinned copper conductors vinyl insulated, chrome vinyl jacket. Cable shall be Belden, Catalog #9434 or approved equal.

Submit sample of cable for approval.

2.3.19.5 "Mic Cable" - Microphone (MIC) cable shall consist of number eighteen (18) twisted, two conductor, shielded cable. Each conductor shall be made up of 16 number 30 tinned copper strands. Both conductors shall be insulated with a minimum of 1/64-inch plastic material having the DI-electric and physical properties of "GEON". The two conductors shall be color coded.

The outside covering shall have 4 ends #34 tinned copper mesh shielding, 16 to 18 picks per inch. The mesh braid shall be give a minimum of 80% shielding. An approved aluminum polyester shield, with no 20 AWG copper drain wire will be acceptable as an equal. The cable shall have a bare number 20 solid tinnier copper conductor within the shield to act as a grounding conductor. This solid conductor shall be connected to the lug and the shield butted and taped back.

Cable shall be RCA CR-18B or approved equal.

Submit sample of conductor for approval.

All microphone cable (MIC CABLES) shall be equipped at the microphone receptacle end with approved U-type solder lugs.



## 16000 - Electrical

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At the Central Control Rack, microphone cables shall be soldered in an approved neat and workmanlike manner to the terminals of the terminal block for microphone conductors.

At the outlying amplifiers, the ends of microphone cables shall be neat, workmanlike and soldered in an approved manner by skilled solderers. Soldering shall be performed without leaving unnecessary lumps, excessive residue of soldering paste, or displaying the characteristics of any other sub-standard soldering methods.

- 2.3.19.6 All Sound System and Intercom System conductors to and between the Central Rack and associated components such as outlying amplifiers, all loudspeakers, all microphone receptacles, all privacy switches, all types of telephones, etc. shall be installed in one continuous length between the terminals of these units and shall be free from splices or other breaks.

Interconnecting terminals as hereinafter specified may be used only at terminals as hereinafter specified may be used only at terminals of loudspeakers, telephones, privacy switches, amplifiers, microphone receptacles, or where directed.

Submit sample of cable for approval.

- 2.3.19.7 All loudspeaker cables (LS cables) shall be terminated in the following manner.

- A. The ends connected to the terminals of the Central Control Rack or the local amplifiers shall be equipped with a Burndy YAV-14-HF solderless U-type lugs, T. & C. "Sta-Kon" Connectors or an approved equal.
- B. The end connected to the loudspeaker transformer leads shall be neatly soldered and taped where such loudspeakers are not equipped with terminal trips. Where loudspeakers are equipped with terminal trips, the ends of "LS Cables" shall be equipped with U-type solderless lugs described above.
- C. Where two or more loudspeakers are on the same circuit, "LS Cables" shall be soldered neatly to the terminals of the loudspeaker transformers to form a "loop" circuit. Where loudspeakers are equipped with terminal strips, stacking U-type terminal lugs, the equal of Burndy type, shall be employed.
- D. Unused leads of taps of loudspeaker matching transformers shall each be separately taped to insulate the conductors from each other and from the grounded parts of the equipment.

- 2.3.19.8 All connections of wiring within the Central Control Rack to terminal blocks shall be performed by the manufacturer of the Central Control Rack.

- 2.3.19.9 All connections of conductors entering the Central Control Rack to terminal blocks shall be performed by the Contractor for Electric Work.

- 2.3.19.10 From a nearby water pipe, a ground wire of size indicated on the Drawings shall be installed in conduit and attached to the frame of the central control cabinet. Ground connection at water pipe shall be by means of a Thomas and Betts 3670 line, Appleton, Crouse-Hinds or other approved ground fitting.

- 2.3.19.11 All connections shall be made under the direct supervision of the manufacturer's representative. Connections shall not be made until the contractor and the manufacturer's representative have explained to the Contracting Officer's representative the procedure to be followed.

- 2.3.20 Microphone Receptacles



Microphone receptacles shall be three pole, each with a separate screw terminal. Ground terminal shall not be connected to yoke. Microphone receptacles shall be the approved equal of Hubbell 7582 (single) and Hubbell 7580 (duplex). A stainless steel face type 302 .035-inch thick and finished to match other face plates in same enclosure, shall be provided for each receptacle. Each face plate shall be inscribed "PHONO-MIC-1", "PHONO-MIC-2", etc.

Certain face plates shall have additional inscriptions as hereinafter noted:

1. In a building equipped with a Sound System, each microphone receptacle in stage front and rear wall of the Auditorium or Assembly platform which is connected to the pre-amplifier, shall be identified as to input number on the pre-amplifier. Additional inscription shall be "Aud. Amp. Input 1"; "Aud. Amp. Input 2"; "Aud. Amp. Input 3"; "Aud. Amp. Input 4", as appropriate to the receptacle.
2. In all buildings the face plate of each receptacle in the auditorium, assembly, gymnasium, and cafeteria, which is connected to the Central Control Rack, shall bear the additional inscription "Cent. Cont. Rack."

### 2.3.21 Antenna for Radio Reception

NOTE: When a building is being equipped with a Television Distribution System the Antenna, Mast and Transmission line herein specified shall be omitted from the Sound System as it will be included as a part of the Television System.

#### 2.3.21.1 General

Furnish and install when indicated on Drawings, an antenna suitable for receiving radio programs on the frequencies from 550 to 1600 kc and from 88 to 108 mc and meeting the following specifications. All parts of the antenna system indicated on the Drawings or herein described shall be furnished and installed by the Contractor for Electric Work.

#### 2.3.21.2 Mast

The mast shall consist of 1-1/2" quadruplicate wrought iron pipe fastened as indicated by the Drawings. All iron parts in connection with masts (including guides, brackets, bolts, etc.) shall be hot dipped galvanized. These parts shall be thoroughly cleaned of grease with gasoline or turpentine. After drying, they shall be give one coast of copper sulfate (6 oz. to each gallon of water), then painted one coat of red lead and two coats of lead and zinc and titanium paint, color as directed. The final coat shall be applied after erection.

#### 2.3.21.3 Antenna

On top of the mast, where indicated on the Drawings, install a horizontal dipole antenna as directed. Antenna shall be tuned to 88 ma for FM and from 550-1600 KC on AM and shall consist of two 5/16" diameter tubular aluminum rods each securely inserted in an approved insulator. Insulator containing rods shall be securely fastened to pipe mast, as directed. Submit sample of insulator and dipole rod for approval before installation. Insulator shall have spark type lightning arrestor that is grounded to mast on installation.

#### 2.3.21.4 Transmission Line

The transmission line from the dipole shall be installed through the weatherhead and conduits, as directed, to the tuner previously specified. The transmission line shall be type RG-6/U, Belden cable



## 16000 - Electrical

---

#8228P or an approved equal. This cable shall be #18 AWG (solid), with a cellular polyethylene insulation and a white, black, light beige vinyl jacket and duofoil and drain shield.

The transmission line shall be supported from the mast in accordance with the details shown on the Drawings. Where transmission line enters the weatherhead install weatherproof glands equal to the sample in the Office of the Contracting Officer.

### 2.3.22 Pilot Lights

In connection with the Central Control Rack and with each of the local amplifiers required by the Drawings or Specifications, there shall be furnished and installed where and as indicated on the Drawings, a pilot light (Type L-94P or L-94 PG), equipped with a 15 watt lamp. Each pilot light shall be connected so as to be illuminated when the main power switch of the unit is in the "ON" position. Glass covering shall be white opalescent.

### 2.3.23 Equipment for Motion Picture Projector

A sound motion picture projector will be supplied by the Contracting Officer. The Contractor for Electric Work shall supply the following:

1- A Femal plug (Cannon No. P-2-CG-11) to fit the MP Sound Receptacle (Cannon No. P-2-36) where indicated for Auditorium and/or Assembly Area usage.

When directed by the Contracting Officer, this Contractor shall connect the above plugs to the appropriate cords of the sound motion picture equipment.

### 2.3.24 Drawings

Before manufacture of the sound equipment, and all associate equipment, there shall be submitted for approval a complete wiring diagram (in quadruplicate) and dimensional and descriptive drawings of all equipment. Drawings of the Central Control Rack and outlying amplifiers and cabinets shall indicate the location of the panels and equipment, and shall provide full descriptive details of all equipment including methods of mounting equipment, wiring details, etc.

### 2.3.25 Supervision and Certification

The installation of the sound equipment, and wiring, shall be performed under the supervision of the manufacturer's engineer.

When the installation is completed, it shall be given an overall performance test for the Contracting Officer's representative. The overall test shall include but not necessarily be limited to the following individual test:

#### 2.3.25.1 Central Control Rack -- Audio Tests

- A. Loudspeaker Circuits -- Transmission of audio signals at normal levels over each loudspeaker circuit for determination of proper loudspeaker volume and operation, and for the purpose of checking actual room numbers vs. the room numbers on the room switch escutcheons.
- B. Input Circuits -- Transmission of audio signals at normal levels over each input circuit for determination or circuit continuity and for checking designations on input selector switches.
- C. All-Call Switch -- Checking for proper operation of this switch on both channels; also for exclusion of loudspeakers not be controlled by same.



- D. Load Test -- Checking for proper system operation when the entire loudspeaker load is applied to either channel.
- E. Remote Volume Controls -- The loudspeaker volume controls in the Auditorium or Assembly Area, Cafeteria and Gymnasium shall be checked for proper operation.
- F. Local System Selector Switches -- In buildings, the switches for control of the loudspeakers in the rooms having local systems shall be checked for priority control. All pilot lamps shall be checked.
- G. Sound Motion Picture Connection -- The complete circuitry of this feature shall be checked with a movie projector or equivalent amplifier device, especially noting proper operation with time signal and Auditorium switch priorities.

#### 2.3.25.2 Central Control Rack -- Program Signal Tests

- A. Automatic Control, All Buildings -- Automatic and manual ring feature of the Program Instrument shall be checked.
- B. Manual Control, -- The "All-Ring" control shall be tested.
- C. Manual Control, -- Each circuit shall be tested for proper operation using the manual ring feature.

#### 2.3.25.3 Auditorium Sound System

- A. Tests 2.3.25.1-A, B, and C above shall be performed on this system. In addition, the remote volume control, the Auditorium Monitor Switch and the priority of Central Control Rack shall all be checked. The Movie Connection circuit shall be tested using a movie projector or equivalent amplifier device. Tape record playback and recorder receptacles shall be tested.
- B. All tests outlined above shall be conducted on this system. All additional features and controls shall be tested; among these shall be the Talk-Playback Switch, "On-Air" fixture controls, etc. The tape recorder, which may actually be located in the Central Control Rack, shall be tested by the making and playing back of a tape obtained from the output of both the Central Control Rack and the Auditorium System.

#### 2.3.25.4 Gymnasium Sound Systems

- A. Input Circuits -- The two input circuits of each Gymnasium amplifier shall be tested from all microphone receptacles.
- B. Output Control -- In the event one amplifier can operate all the loudspeakers in both halves of a split gym, the switch permitting this control shall be tested.

#### 2.3.25.5 Cafeteria Sound System

- A. Input Circuits -- Repeat the test outlined in M. above.
- B. Output Circuits -- In the event there are switches for control of loudspeakers to avoid acoustic feedback, they shall be tested for proper operation, and checked to determine that priority control of the Central Control Rack obtains with the switches in the OFF position. Switches for control of loudspeakers in Convertible Rooms shall be tested.

#### 2.3.25.6 Emergency Sound Alarm





## 16000 - Electrical

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Test the momentary contact buttons in General Office. Check reset button and pilot light for deactivation of system.

### 2.3.26 Omissions

These specifications do not enumerate all the details of fitting and accessory equipment required for proper operation of the systems herein described. It is understood that all necessary and required equipment shall be supplied complete by the Contractor without extra compensation even though not specifically mentioned herein.

### 2.3.27 Instructions

2.3.27.1 The contractor shall arrange with the manufacturers of the equipment to instruct persons designated by the Contracting Officer, in the proper operation and care of the systems herein described. It is understood that all necessary and required equipment shall be supplied complete by the Contractor without extra compensation even though not specifically mentioned herein.

2.3.27.2 An approved schematic wiring diagram showing the interconnections between the various units of the sound equipment shall be mounted behind a transparent, non-breakable, non-inflammable plastic face, set in a suitable wooden frame and fastened by machine screws to the inside rear door of the Central Control Rack.

2.3.27.3 A complete schematic diagram (in triplicate) of the sound & intercom equipment, as installed, showing all connections to units and parts thereof, both internal and external, shall be delivered to the Contracting Officer.

2.3.27.4 A set of simple operating instructions for operation and care of the sound equipment shall be mounted at a location selected by the Contracting Officer.

### 2.3.28 Notification of Changes of Equipment

When inspecting or supervising the installation of equipment, manufacturer's representative shall be accompanied at all times by the Contracting Officer's representative. In order to make the necessary arrangements, the Contracting Officer shall be notified at least 48 hours in advance of the time the manufacturer's representative plans to visit the Building.

Any changes of equipment shall be made only with the written permission of the Contracting Officer.

Changes in location of equipment may be made with the permission of the Contracting Officer's electrical representative at the Building. However, a written memorandum of these changes of location shall be forwarded to the Office of the Contracting Officer.

All changes of location of equipment (including pull boxes, conduit runs, wire sizes, etc.) shall be incorporated in the framed Sound System & Intercommunication Riser diagram installed in the Building.

## 2.4 Interior Telephone System

### 2.4.1 General

Furnish and install an automatic dial type telephone system as shown on the drawings and hereinafter described. Exchange shall be either wall or floor mounted with built-in or externally mounted power supply.





### 2.4.2 Raceways and Conductors

Unless otherwise specified or noted conduits, conductors and boxes shall be in accordance with Sect. 16-5, Conduit & Raceway Systems and Sect. 16-7, Wiring Systems and/or with applicable detail drawings. Install a main terminal box at location indicated on drawings. All telephone distribution conduits shall terminate at this terminal box. Terminal box shall be No. 14-gauge galvanized steel, not less than 36-inches high by 24-inches wide by 4-inches deep with hinged door and snap catch. Terminal box shall be painted, color as selected and shall be stenciled as directed.

Terminal strips as specified shall be provided for full exchange capacity. (Exception see Par. 16-7.36).

Extend cable or telephone line wires in conduit from terminal box to exchange, allowing for flexible connection where necessary.

### 2.4.3 Exchange Unit

The exchange unit shall be of the all electronic solid state type. No electric-mechanical relay shall be permitted. Exchange shall automatically disconnect from the exchange any telephone which is taken off the hook and where dialing has not commenced within fifteen (15) seconds. Exchange shall also disconnect any telephone line which has been opened or shorted.

The telephone exchange shall be fully compatible to interconnect with NY Telephone Company lines at some time in the future. It shall be furnished with all additional equipment so that the future addition of an "interconnect unit" will make certain chosen telephones capable of connect with the NY Telephone Company System. The instruments shall be chosen in the future at the time the interconnect unit is specified and installed.

Exchange shall be solidly connected in an approved manner to the floor slab or wall slab. No wheels shall be mounted on the unit when permanently set in place.

All equipment shall for purposes of maintenance, be mounted at a height no lower than twenty-four (24)-inches above the finished floor.

Exchange shall be the approved equal of Telephone Sales & Service Comtrac Units.

### 2.4.4 Telephone Equipment

Telephone equipment shall be the equal of Automatic Electric Co. P-A-X, Kellogg Switchboard Co., Model KMG, Stromberg Carlson X-Y System, Strom Dialmaster System, DuKane Corp., Nippon Elect Pax, Modern Telephone Corp., fully automatic system.

Where the capacity of the system does not exceed forty (40) lines, the Kellogg Select-o-Phone, Strom Dial X, Modern Phone or DuKane Corp., fully automatic will be acceptable.

### 2.4.5 Power Supply

Power supply shall consist of a battery eliminator, providing not more than 50 volts, from a 110-125 volt, 60 Hz AC input. Power supply shall be of sufficient capacity to satisfactorily operate exchange equipment to the full capacity of the trunkage (Simultaneous Conversations) specified. Power Supply shall be Automatic Electric, Raytheon, Schavr Machine Company or an approved equal. Power Supply may be part of the exchange.

### 2.4.6 Capacity



## 16000 - Electrical

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The exchange shall be aired and equipped for not less than the number of lines and the minimum number of simultaneous conversations specified in Amendments.

In no case shall the quantity of lines, specified in the Amendments, be less than the amount of telephone instruments indicated on the drawings.

When two (2) exchanges are required to meet the specification, the first exchange shall be completely wired to its full capacity. The second exchange shall contain the remaining required lines.

### 2.4.7 Characteristics

The following minimum operational requirements shall be complied with:

- 2.4.7.1 Each station shall be able to communicate with any other station, the connection being established by means of switching apparatus controlled by a calling dial mounted on the telephone.
- 2.4.7.2 Any two telephones shall be able to communicate without being interfered with by any other station.
- 2.4.7.3 Access to any station already in use shall be automatically prevented. When such access is attempted, a busy tone shall be automatically transmitted to the calling station.
- 2.4.7.4 Ringing of bells shall be automatic, except that for 40 lines or less, bells may be controlled from a button on the calling party's telephone.
- 2.4.7.5 The ringing of a bell at the station called shall be indicated to the receiver of the calling party.
- 2.4.7.6 The equipment shall be of such design that only a single two-copper conductor or three-copper conductor line shall be required between each telephone and the exchange unit.
- 2.4.7.7 Executive right of way or cut-in connections are not to be provided.
- 2.4.7.8 The system shall provide architectural dialing (Exact Room Numbers) where possible within the limitations of each approved system. This shall not eliminate the requirement for directories at each telephone instrument.

### 2.4.8 Telephones

All telephones shall be equipped with a standard ceiling dial consisting of a revolving disc having ten (10) finger holes under which shall be mounted a stationary enameled plate marked with numerals 1, 2, 3, etc. to 0 inclusive, in black on a white background. All telephones shall be of the self-contained type with anti-side tone characteristics, equipped with bell ringer assembly and a retractable cord as approved by the Contracting Officer.

### 2.4.9 Dial Telephone - Desk Type

Desk telephones shall be of modern design, of light weight, and portable, the approved equal of Automatic Electric Company Type-80.

Each outlet for a desk type telephone shall consist of 4-11/16" sq. box with a single gang switch cover. Install a standard telephone connection block mounted on a recessed "U" strap, fastened to the switch cover, and a one-gang standard telephone plate with grommeted hole.

### 2.4.10 Dial Telephone - Handset Exposed



Surface mounted telephones of this type shall be of a design to match the desk telephones and suitable for wall mounting the approved equal of Automatic Electric Company, Type-90. Instrument shall be mounted over a 4" square box, center line + 4'8" above finished floor.

### 2.4.11 Dial Telephone - Handset in Cabinet

Each telephone of this type that is to be mounted in a new cabinet, shall be either surface mounted or flush mounted or as indicated on drawings. Cabinet shall be constructed as per Standard Detail Drawing 775B with a flush ring catch in all areas of instruction. Catch shall be the approved equal of Corbin No. 15631.

Telephones located in the Lobby or on the Platform or Stage shall be provided with a lock in lieu of a ring catch.

Furnish and deliver two (2) keys to the Custodian for each locked wall box. Center-line of box shall be approximately 4'6" above the floor. Telephone shall be the approved equal of Automatic Electric Company Type 90, Kellogg or Strom Communications.

### 2.4.12 Elevator Cab Telephone

Furnish and install a telephone the equal of Automatic Electric Co., Type 90, Kellogg or Strom Communications the General Construction Contractor will provide the box in the elevator and trailer cable to the box. Electrical Contractor shall make all necessary connections for the proper functioning of the telephone. This Contractor is cautioned to properly coordinate this installation with GC Contractor.

### 2.4.13 Loud Ringing Bell (Boiler Room)

Furnish and install in Boiler Room where indicated a loud ringing 6" bell of the splash-proof construction, designed to operate with the telephone system selected.

### 2.4.14 Fault Signal

Where the exchange capacity exceeds 50 lines, furnish and install the following: On the telephone exchange unit and also in the Custodian's Office a buzzer and/or a signal light which will indicate by audible and/or visual means where there is a malfunction in the exchange unit. Provide necessary copper conductors and raceway to effect the foregoing. Install in the Custodian's Office a cut-off switch for controlling this buzzer and/or light.

### 2.4.15 Directories

For each telephone and for telephone exchange unit, furnish and install a printed or typewritten directory. Directory shall consist of a substantial aluminum back plate and frame approximately 5-1/2" x 8" with directory card and unbreakable non-inflammable transparent plastic face. Directories shall list the location of all telephones which can be dialed and their corresponding call numbers. The directory list shall be arranged in alphabetical order using official room or area designation. Where room numbers are necessary they shall be arranged numerically. Submit proposed directory and frame for approval. Rooms with desk type or surface type telephones, the back plate of the directory frame shall be fastened to the wall near the telephones, at location selected by the Contracting Officer. In rooms with recessed telephones the directories shall be fastened to the inside of the door of the flush mounted telephone box in such a manner as not to leave anything projecting on outside of door.

### 2.4.16 Drawings



## 16000 - Electrical

Furnish one complete set of assembly drawings, circuit diagrams, adjustment sheets and all instructions necessary for the proper operation and servicing of equipment.

### 2.4.17 Installation and Guarantee

The Contractor shall install all equipment and turn the system over the Contracting Officer in a first-class operating condition. The Contractor shall deliver to the Contracting Officer before the system is finally accepted, the following:

- A. A certificate from the manufacturer of exchange stating that the system has been installed under their supervision and is satisfactory to them.
- B. A written guarantee from the manufacturer of exchange guaranteeing telephone equipment for a period of three years, during which time the manufacturer shall agree to keep equipment operating to the satisfaction of the Contracting Officer. This guarantee shall also include a statement that all parts requiring placement or adjustment during the period of guarantee, will be replaced or adjusted by the manufacturer without cost to the Contracting Officer, where this replacement or adjustment is not made necessary by misuse or abuse by the Contracting Officer.

### 2.4.18 Optional-Inclusion of the Interior Telephone System as Part of the Sound System

At the discretion of the Contracting Officer the contractor is permitted to include this Interior Telephone System as part of the Sound System. This shall apply only where the plans and specifications require him to provide separate Sound and Interior Telephone Systems. This contractor, at his option, may furnish and install separate Sound/Security and Interior Telephone Systems or a combined system. The combined system shall have the telephone exchange equipment specified above installed within in Central Control Rack of the Sound Systems. All performance requirements listed above shall apply to the combined system. This system shall be the equal of Rauland-Borg Telecenter I modified to meet the above specifications and the specifications of the Sound/Security System. This contractor shall furnish and install all additional conduit and girding required to reroute all telephone lines from the telephone terminal box to the Central Control Rack if he should avail himself of this option.

This contractor may delete the interior telephones on each desk where an administrative telephone is specified if he should avail himself of this option. Only one phone in the General Office may be deleted in this arrangement. The Administrative Telephone shall be of a type capable of handling all the functions of a telephone in Interim Telephone System along with all its functions as part of the Sound/Security System.

## 2.5 Interior Telephone System (Primary and Intermediate.)

### 2.5.1 General

Furnish, install and connect a telephone intercommunicating system only where this type of system is specifically called for on the plans or in the amendment. This shall be a 16 station system with selective ringing and eight (8) simultaneous conversations. This system shall be comparable to the TSL-16 Bogen Series, DuKane or an approved equal.

### 2.5.2 Equipment

#### 2.5.2.1 Interior Telephone (handset exposed)



ST-16 is a one ring button and fifteen (15) easy press station selector buttons telephone. The telephone is 9-1/2" width x 3-1/4" deep x 3-1/2" high. This shall be similar to Bogen TSL-16, DuKane approved equal.

### 2.5.2.2 Interior Telephone (Handset Concealed) (Lobby)

This telephone shall be the same as described in paragraph (2.5.2.1) with the exception that it shall be installed in a locked box. Dimensions of this box shall be suitable, so as to house telephone described in paragraph 2.5.2.1. Box shall be similar to Std. Det. Dwg #775B. Telephones are to be furnished and installed at locations indicated on drawings.

### 2.5.3 Elevator Cab Telephone

Furnish and install a telephone the equal of Bogen TSL-16, DuKane. The General Construction Contractor will provide the box in the elevator and trailer cable to the box. The Electrical Contractor shall only connect the phone to the General Office, Custodian's Office, Lobby and the Boiler Room. The phone shall be modified so that only these four areas will be shown and all the remaining buttons shall be blanked. Electrical Contractor shall make all necessary connections for the proper functioning of the telephone. This contractor shall also be cautioned to properly coordinate this installation with the GC Contractor.

### 2.5.4 Power Supply

STP-16 is the power supply required for each telephone system. Power drain is negligible when system is inactive. This power supply shall be placed in the central control rack of the Sound and Telephone Intercommunicating System.

This power supply shall be similar to Bogen PRS-16A, DuKane approved equal.

### 2.5.5 Conductors

Total number of unshielded conductors common to all phones shall be 3 more than the total number of phones in the system. A 16 station system will be interconnected with a 20 conductor unshielded cable, #22 wire (AWG.) Use parallel conductors, not twisted pairs.

## 2.6 Intercom System

### 2.6.1 General

Furnish and install an intercom System consisting of five executive intercom stations, with a priority over-ride for the security office unit, terminal board and a power supply. Electrical Contractor shall furnish and install all associated conduit and wire required to provide a complete operating system.

### 2.6.2 Executive Intercom Stations

The Executive Intercom Stations shall selectively call and communicate with any other executive stations. The unit shall contain an integral amplifier and speaker with a permanent magnet cone. Once contract has been established between any two Executive Intercom Stations, interruption of contact shall only be by the security office unit, having priority of all other units. Each executive unit shall have a handset and cradle for private conversation. Cradle shall disconnect loudspeaker, upon lifting handset, and transfer voice communication to the handset. Each unit shall contain a soft audible signal for incoming calls and an incoming call light, a busy light and in-use light.



## 16000 - Electrical

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"Listen-Talk" switch shall be pushbutton type or cross bar with palladium contacts. Units shall also contain a "Volume-On-Off" control for incoming calls. Housing shall be die cast metal with hammertone grey finish. Units shall be Executone, Inc. Model No. 111DH, desk unit, or equal.

### 2.6.3 Terminal Board

The terminal board shall be as described in Auditorium Intercom System, except it shall have 3 terminal blocks, Executone, Inc. Model J52.

### 2.6.4 Power Supply Unit

The power supply unit shall have a 120 volt AC, 60 Hz input supply through 6 foot, 3-wire cord and plug and an output of 24 volt, DC well filtered supply. Unit shall contain an integral cartridge type fuse for DC current supply. Power supply shall also have a full wave silicon rectifier, choke and condensers. Housing shall be sturdy metal, for wall mounting and finished to match in appearance the terminal board. Unit shall be Executone, Inc. Model No. M217, or equal.

## 2.7 Public Telephone Conduit System

### 2.7.1 Scope

2.7.1.1 The work under this Section shall consist of furnishing all labor, materials, equipment and appliances necessary and required to install all empty conduits, outlets, cabinets, etc., for the telephone system as required by the Drawings and specified herein.

2.7.1.2 The Contractor shall confer with representatives of the Telephone Company and shall make the installation conform with their regulations in every respect.

### 2.7.2 Service Conduits

For service into the building suitable service conduit of size, etc., indicated on the drawings shall be installed. Where telephone conduit is run up a pole (unless otherwise directed by the Telephone Company) it shall terminate 8 feet up in a threaded end and weather-proof cap satisfactory to the Telephone Company.

### 2.7.3 Interior Conduit System

2.7.3.1 Furnish, install and connect a complete empty conduit (including drag wire for one-inch conduit or larger) system. "No instrument wire" for telephones, including all strip, junction, pull and outlet boxes from the point of service entrance to the various locations throughout the building ready for instruments and wiring.

2.7.3.2 For work within the building, conduit and boxes shall be galvanized and shall be of sizes as indicated on the Drawings.

2.7.3.3 Telephone strip boxes shall be built by a box manufacturer. Boxes shall "Bent-up" and welded or riveted without angle frames. All boxes shall be No. 14 U.S.S. gauge minimum.

2.7.3.4 A door or doors shall open full width and height of the box and shall be hung on hinges, and shall be equipped with a ring catch.

### 2.7.4 Wall Outlets

2.7.4.1 Telephone outlet boxes 4-11/16" square, 2-1/8" deep, with single gauge cover and 1/2" clear grommet in finish plate, shall be placed at the location shown on the drawings.



- 2.7.4.2 Where desk or hand type telephones are to be used, these outlets shall be placed 18" above the baseboard. Each outlet shall be provided with a telephone plate made of the same material and finish as specified for electric light switch and receptacle plates in the same room and have a bushed hole for cords. All boxes shall be set flush in wall.
- 2.7.4.3 Where wall type instruments are to be used, each outlet shall be centered 4' 9-1/2" above floor, and shall be equipped with a blank plate to cover the opening.
- 2.7.4.4 Where telephone booths are to be installed, the location and height of each outlet shall be as specified by the Telephone Company Public Coin Box Department and shall be provided with a standard telephone plate with a bushed hole. Where booths are supplied by the Telephone Company only one outlet each, for electric and telephone, is required for up to six booths in a bank.
- 2.7.4.5 Where the telephone booths are to be installed, this contractor shall furnish and install, a 120 volt outlet for electric light in the booth. This outlet shall be located at height specified by the Telephone Company Public Coin Box Department.
- 2.7.4.6 Floor Outlets
- Standard under-floor outlets shall be provided where required and such outlets shall be equipped with a rise nipple when in service and with a removable water-proof flush type cover when not in use.
- 2.7.4.7 Grounding Conduit
- A. A 3/4-inch empty conduit shall be installed from the grounding busbar to the telephone service entrance. Grounding connections shall be made as directed.
- B. See Section 16-3 for grounding busbar connections, etc.
- 2.8 Corpus Christi Army Depot Police Call System
- 2.8.1 General
- The Electrical Contractor shall provide facilities as required by the Local Police Telephone Call System, where indicated on the drawings and as hereinafter specified. The following types of installation are required, as indicated on the drawings.
- 2.8.2 Police Department Telephone Post
- The Police Department shall select a street location for a proposed Police Telephone Post.
- The Electrical Contractor shall furnish and install the concrete foundation for the post, the post standard and base and an astronomical clock in accordance with the drawings. The foundation shall be flush with the grade. Foundation shall contain two, 2-inch service conduit elbows, one floor telephone wiring and one for 120 volt elbows, one for telephone wiring to the illuminated sign on the post. The elbow within the post will terminate 6" above the top of the foundation and the elbow at the opposite end will terminate at a level of 30" below grade.
- The Police Department shall furnish an illuminated post sign which shall be picked up by the Electrical Contractor and deliver it to the building site. The Police Department will furnish and install the Police Telephone.
- The Electrical Contractor shall install the illuminated sign on the post and the 120 volt wiring complete within the building and continued underground to the Police Department Post and make all





## 16000 - Electrical

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connections complete within the post. The Electrical Contractor shall install the astronomical clock in the illuminated sign circuit wiring within the Switchboard Room at location indicated or directed. The conduits for Telephone and 120 volt wiring shall be connected to the respective elbows at the post foundation by the Electrical Contractor.

The Electrical Contractor shall telephone the Police Department at 374-6792 at least 72 hours prior to installing the proposed work.

### 2.8.3 Street Lighting Standard

Where a Police Call Box is to be located on a street lighting standard (an existing light standard or a new light standard), the Electrical Contractor will terminate and connect the 2" underground telephone service conduit in an elbow outside the foundation base. The elbow in the concrete base for a new or proposed lighting standard will be installed by the utility company. The 120 volt supply and wiring to the illuminated sign is the responsibility of the utility company.

The Electrical Contractor shall notify the appropriate Corpus Christi Army Depot officials 72 hours prior to the installation of the proposed work.

### 2.8.4 Wooden Utility Pole

Where a Police Call Box is to be located on a wooden utility pole, the Electrical Contractor will install two, 2" service conduits on the pole for telephone and 120 volt supply. These conduits shall be run 12" above the sidewalk grade alongside of pole and capped. The Electrical Contractor shall notify the appropriate Corpus Christi Army Depot officials at least 72 hours prior to installing the proposed work.

### 2.8.5 Wooden Utility Pole

When a Police Call Box is to be located on a wooden utility pole, the Electrical Contractor will install two, 2" service conduits shall be run 12" above the sidewalk grade alongside of pole and capped. The Electrical Contractor shall telephone the notify the appropriate Corpus Christi Army Depot officials at least 72 hours prior to installing the proposed work.

## 2.9 Power Pack Units

### 2.9.1 General

2.9.1.1 Furnish, install and connect complete self-contained power supply units, flush mounted in apron of laboratory tables together with other accessories, as shown on plans and as specified herein.

2.9.1.2 All require accessory materials - whether detailed herein or not - shall be supplied so that the final arrangement will leave the system in a completely satisfactory operating condition and shall meet the performance characteristics outlined herein.

2.9.1.3 Schematic wiring diagrams, detailed working drawings (shop drawings) and lists of specific materials shall be submitted for formal approval preceding fabrication and each complete panel shall be available at factory for inspection prior to shipment to job site.

2.9.1.4 The manufacturer of these power supply units shall furnish six (6) copies of instructions in booklet form complete with schematic wiring diagrams, explaining the operation of each power supply unit and accessories.

2.9.1.5 A schematic wiring diagram showing all components and wiring of each unit shall be mounted on the inside of the panel.





- 2.9.1.6 Approved manufacturers of the assembled power panels are as noted below or approved equal:
- A. Standard Electric Time Co., Springfield, Mass.
  - B. Hampden Engineering Corp., East Longmeadow, Mass.
  - C. Ariel Davis Mfg. Co., Salt Lake City, Utah
  - D. Superior Electric Co., Bristol, Conn.
- 2.9.2 Construction
- 2.9.2.1 Each unit shall consist of an outer housing designed to facilitate table mounting and a cabinet or box to house power supply components. Control equipment and output receptacles for the power supplies shall be located on the face of this cabinet. The components cabinet shall be mounted within the outer housing with fastening devices not accessible from the front, and shall be provided with two pull handles and drawer slides to allow for easy removal for servicing. Slides shall be provided with a positive stop so that the cabinet cannot be withdrawn in one motion. The stop mechanism shall be such that simultaneous release of the stop, while lifting the cabinet from the housing, shall not be necessary. Stop mechanism shall not require resetting when the cabinet is reinstalled.
- 2.9.2.2 The front of the entire unit shall be covered by a door, hinged at the top, which shall be retractable when in the open position so that the cover will be protected and will be out of the way. The cover shall be provided with suitable handle and keyed lock. All units are to be keyed alike, using a Corbin 15751XC25 lock and key #30. The overall dimension shall not exceed 24" wide x 12" high x 22" deep. Units shall be constructed of steel having a minimum thickness of #14 gauge.
- 2.9.2.3 The outer housing shall have an overlapping flange, in front, of sufficient width to cover the cutoff in the furniture in which the unit is mounted. Threaded studs shall be welded to the rear of the flange, in each corner, for use in bolting the unit to the table without bolt heads being visible or accessible from the front. An adjustable brace shall be provided to support the rear portion of the housing from the internal table structure and from the floor.
- 2.9.2.4 The component cabinet shall be ventilated, for purposes of heat dissipation, across the full top and rear. Ventilating shall be by means of perforate metal having openings no larger than 1/8" and having an open area of not less than 50%.
- 2.9.3 Finish
- 2.9.3.1 All metal surfaces shall be deburred and buffed to remove scratches. Prior to final finishing the units shall be degreased in a vapor bath.
- 2.9.3.2 Surfaces, both interior and exterior, shall be primed with a rust inhibiting zinc chromate primer followed by two coats of Atlas SY111-64 grey texture paint. After finishing the paint shall be over cured to provide a smooth, durable surface.
- 2.9.4 Components
- 2.9.4.1 All components not specifically mentioned, shall be of the best commercial quality available. Other parts shall be as specified in the following paragraphs.
- 2.9.4.2 Variable auto-transformers, for use as voltage control devices, shall be Underwriter's Laboratories, Inc., approved. Dials furnished with these units shall be calibrated from 0-10.



## 16000 - Electrical

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- 2.9.4.3 Circuit Breakers, for protection of the various power supplies, shall be the fully magnetic type suitable rated. No fuses shall be required or used for this purpose.
- 2.9.4.4 Pilot light assemblies shall be of a tamperproof design, removable only from the rear. Lamp circuits shall incorporate a series resistance so as to provide a minimum lamp life of 10,000 hours.
- 2.9.4.5 Rectifiers shall be the silicon diode type connected in a full wave bridge circuit and mounted on properly proportioned heat sinks for convection cooling. Cells shall be capable of operating continuously at full-rate current in the ambient temperature of 50 degrees Centigrade.
- 2.9.4.6 Transformers shall be double wound, isolating type, conforming in all respects to NEMA standards for specialty transformers. After winding, transformers shall be vacuum impregnated with coil varnish and baked. The assembled transformers shall have a moisture and corrosion resistant coating. Filter reactors shall be of similar construction.
- 2.9.5 Wiring
  - 2.9.5.1 All wiring connections between power supply component shall be made with type TW thermoplastic wire meeting requirements of IPCEA and METRA standards and shall be Underwriter's Laboratories, Inc., listed for 90 degrees Centigrade in air. Wire sizes shall comply with the National Electrical Code. All wiring shall be neatly cabled and laced.
  - 2.9.5.2 A four foot 3 conductor #12 neoprene insulated power cord shall be attached to the component cabinet for 120 volt AC power-input connections. This cord shall be provided with a strain relief when it passes through the cabinet. A 3 wire, 20 ampere, grounding type cord cap shall be provided on the end of the cord for connection to a suitable 120 volt AC outlet located in the laboratory tables.
- 2.9.6 Power Supplies
  - 2.9.6.1 All power supplies shall be completely self-contained within the component cabinet, and shall be available for simultaneous use at full capacity. On the front panel face shall be located all controls, circuit breakers, pilot lights and output receptacles. All component items on this panel shall be identified by means of 1/8" thick, 5-ply white core engraved legend plates attached to the panel by non-removable means. All equipment on the control panel shall be counted to the panel in such a way that mounting screws cannot be tampered with.
  - 2.9.6.2 The following items shall be provided on the control panel for each voltage supply; variable auto transformer (variable supplies only), output circuit breaker, pilot light and output receptacles.
    - A. Output receptacles for fixed 120 VAC supplies shall consist of two, convenience outlets, 3 wire grounding type, rated 15 amperes.
    - B. Output receptacles for all other supplies shall consist of four single pole, 25 ampere, socket receptacles connected in pairs so as to allow two loads to be connected simultaneously to each supply.
    - C. Output receptacles shall be located on the upper portion of the equipment panel.
  - 2.9.6.3 Variable voltage supplies shall be variable from 0 to full rated output voltage with a full load current rating of 15 amperes.
    - A. Variable e DC supply at instructor's unit shall have an output ripple not exceeding 1% RMS. Regulation shall not vary more than 9% at 120 volts and full rated load. Variable DC supply at



users' unit shall have an output ripple not exceeding 1% RMS. Regulation shall not vary more than 9% at 30 volts and full rated load.

- B. Variable AC supplies may have one side of the line common to the building service neutral. AC output is to be an undistorted sine wave at all voltage settings.
- 2.9.6.4 Fixed 6.3 volt supplies shall be isolated from ground and shall have a full load output of 10 amperes.
  - 2.9.6.5 Fixed 120 volt AC supplies shall be derived from the building service and shall be rated at 15 amperes.
  - 2.9.6.6 Building ground connections shall consist of two 75 ampere binding posts .
  - 2.9.6.7 All output receptacles shall be color coded for purposes of terminal identification.
    - A. Variable 120 volt DC Output coded black, negative and red positive.
    - B. Variable 30 volt DC output coded brown, negative and maroon positive.
    - C. Variable 120 volt AC output coded black, line and white neutral.
    - D. Fixed 6.3 volt AC output coded mint.
    - E. Fixed 120 volt AC output receptacles.
    - F. Building ground binding posts coded green.
  - 2.9.7 Patch Cords
    - 2.9.7.1 Each power supply of each unit having single pole output receptacles shall be furnished with a pair of patch cords for use in making connections to experimental equipment.
      - A. Patch cords shall be approximately four feet long and shall utilize #16 super flexible neoprene insulated wire approximately 3/16" outside diameter.
      - B. Connector on one end of each cord shall be a 25 ampere single pole plug with insulated handle to mate with the supply output receptacles.
      - C. Connector on opposite end of each cord shall be a solid copper spring clip having four-inch long limp rubber insulator which shall incorporate a two-inch long, tapered flexure section to minimize wire breakage due to flexure being concentrated at the wire entry point.
      - D. One half of the cords shall be furnished with red insulating handles, the other half have black handles.
    - 2.9.7.2 For fixed 120 volt AC supplies provide two 3 wire, male grounding type cord caps, of the metal armored type having a positive cord grip. Rating shall be 15 amperes.
    - 2.9.7.3 For ground connection furnish one cord having a banana plug with a green insulating handle on one end an alligator clip with green insulator on the opposite end.
  - 2.9.8 Instructor Unit (X-1)

These units shall be equipped with the following voltage supplies:

    - A. 0-120 volt            AC variable - 10A



## 16000 - Electrical

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B. 0-120 volt DC variable - 10A with 9% regulation at 120 volt and 1% RMS maximum ripple.

C. 6.3 volt AC fixed - 10A

D. 120 volt AC fixed - 15A

### 2.9.9 Illuminated Meter Panel (X-3)

2.9.9.1 Illuminated meter panel, X-3 shall be semi-flush, wall mounted type, where indicated on Drawing. The equipment shall be manufactured by Hampden Engineerig Corp., or approved equal.

2.9.9.2 The cabinet shall be approximately 50" wide, 16" high and 10" deep at top and 9" deep at bottom, providing a sloping meter sheet steel. The assembly shall be furnished grey Hammertone. The front meter panel shall be 11-gauge steel and each of the four meters shall be flush mounted on a separate hinged door.

2.9.9.3 Across the width of the cabinet, located above the meters, provide a fluorescent lighting fixture complete with lamp and hood. The ballast and any accessory lamp equipment required shall be installed within the cabinet.

2.9.9.4 The meter cabinet shall include:

A. One (1) rectifier-type AC ammeter, scale 0-15 amperes, Westinghouse Type KC-26

B. One (1) rectifier-type AC voltmeter, double scale 0-75 and 0-150 volts, Westinghouse Type KC-26.

C. One (1) DC voltmeter, double scale 0-75 and 0-150 volts, Westinghouse Type KX-26.

D. One (1) DC ammeter, scale 0-15 amperes, Westinghouse type KX-26, complete with calibrated leads of a length to conveniently reach the meter connection panel.

2.9.9.5 All wiring within the cabinet shall be #12 conductors and all wires, except for calibrated ammeter leads, requiring outside connection shall terminate at a terminal block. Any excess length of calibrated ammeter lead shall be neatly coiled and securely fastened within the meter cabinet.

### 2.9.10 Meter Connection Panel (X-4)

2.9.10.1 Meter connection panel X-4 shall be mounted in the demonstration table where indicated on Drawing.

The equipment shall be as manufactured by Hampden Engineerng Corp., or approved equal. The cabinet shall be approximately 22" wide, 12" high, and 10" deep, fabricated from 16 gauge steel, finished grey "Hammertone". The Cabinet shall be equipped from with a bottom hinged front door. Furnish two keys for each lock. A set of two angle-iron members shall be provided to facilitate mounting the cabinet in the table.

2.9.10.2 The operating panel shall be accessible through the front hinged door. The front control panel shall be satin brush finished aluminum 3/16" thick, with the apparatus designation engraved in its surface. The following equipment shall be mounted on the panel and shall be accessible to the instructor:

A. Three (3) pin-style receptacles for DC voltmeters; red caps for positive termination and black caps for negative.



- B. Two (2) receptacles, one pin style and socket style, for DC ammeter; blue cap for positive termination and green cap for negative.
- C. Three (3) pin style receptacles for AC Voltmeter; yellow caps for one side of line and white cap for other side.
- D. Two receptacles, one pin style and one socket style for AC ammeter; light blue cap for one side of line and orange cap for other side.
- E. Two (2) push-to-read ammeter switches; one for AC ammeter and one for DC ammeter.
- F. One (1) tumbler switch for fluorescent lamp used to illuminate the demonstration meters. A red lens indicating lamp shall be provided to show fluorescent lamp is energized.

2.9.10.3 The receptacles shall be 50 ampere capacity.

Type KR-5S socket style and Type HR-5P pin style. All receptacles shall be color coded. All plug and receptacle pin parts shall be fabricated from high-quality bronze having conductivity of 200% of brass and a tensile strength 150% of brass.

2.9.10.4 With the meter connection panel provide four single-conductor cord sets each 6 feet long, made up of #14 extra-flexible wire having a Type HP-5S socket type plug on one end and an insulated type HC-2 spring clip on the other end. Also provide two cords as described above, except equipped with Type HP-5P plugs instead of the HP-5S socket plug.

2.9.10.5 Within the cabinet the following apparatus shall be securely mounted and wired with #12 conductors to the receptacles and outgoing connection terminal block:

One (1) meter shunt for the DC ammeter rated 15 ampere.

2.9.11 Guarantee

After installation, the manufacturer of the laboratory power supply units and the accessory materials thereof, shall provide the services of a factory trained engineer to inspect each unit, instruct building personnel in its operation and provide written guarantee for not less than one (1) year, after acceptance, against all mechanical and electrical defects with free service for the same period.

2.9.12 Approved Shop Drawings

The electrical Contractor shall furnish the General Contractor with manufacturer's approved shop drawings complete with details and dimensions required to install units into equipment or tables.

END OF SECTION 16000

END OF SPECIFICATION SECTION 16 - Electrical



## 16000 - Electrical

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